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NUCLEAR SCIENCE ABSTRACTS

Volume 11 May 15, 1957 No. 9

GENERAL

ATOMIC BOMBS AND WARFARE

4778 USNRDL-TR-127
Naval Radiological Defense Lab., San Francisco.
A FALLOUT PLOTTING DEVICE. E. A. Schuert. Nov. 30, 1956. 23p. Project NS 081-001.

A fallout plotting device was developed. The method requires no drafting equipment and is ideally suited for field use. At Operation REDWING it was found that untrained personnel could quickly become proficient in its employment. (auth)

ATOMIC POWER

4779 DL-28A
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River Ont.
SCIENTIFIC PROSPECTS IN ATOMIC ENERGY. Address to the Eighth Symposium of the Defence Research Board, December 13, 1956. W. B. Lewis. Feb. 1957. 11p. (AECL-404).

The prospect of achieving competitive power from fission and fusion processes is discussed. Brief mention is made of some uses for fission products. (T.R.H.)

BIOLOGY AND MEDICINE

AEROSOLS

4780 UR-475
Rochester, N. Y. Univ. Atomic Energy Project.
CHARGING AND PRECIPITATION CHARACTERISTICS OF SUB-MICRON PARTICLES IN THE ROHMANN ELECTROSTATIC PARTICLE SEPARATOR. Thomas T. Mercer. Nov. 8, 1956. 48p. Contract W-7401-eng-49. $7.80(ph OTS); $3.30(mf OTS).

RADIATION EFFECTS

4781 ANL-5655
Argonne National Lab., Lemont, Ill.
BIOLOGICAL AND MEDICAL RESEARCH DIVISION QUARTERLY REPORT [FOR] JULY, AUGUST, SEPTEMBER 1956. Dec. 1956. 142p. Contract W-31-109-eng-38. $0.70(OTS).

Progress is reported in the following studies: the effects of γ rays on the serological properties of ovalbumin; the effects of γ irradiation on polio virus; the influence of specific nutrients on the mating reaction in Tetrahymena; a statistical method of determining association between unordered pairs applied to studies on paramecium after autogamy; the induction of mutants of E. coli resistant to T5 bacteriophage by the application of various drugs; the toxicity of locally deposited Y^{91} in mice; the effects of radiation on the mating reaction in paramecium; amino acid synthesis; early changes in plasma glucose concentration following x irradiation in adult chickens; the biosynthesis of methionine in bacteria; protein synthesis in the pancreas; electron microscopic investigation of paramecium cell borders and the capillaries of the liver; dose rate effect upon teratogenesis in grasshoppers; the survival of mice given daily doses of γ radiation; the acute lethal response of first and second generation mice to whole-body exposure to x radiation; the toxic effects of D_2O for rats; tracer studies on the formation of indole-3-carboxaldehyde; the mortality of female mice exposed to Co^{60} γ irradiation; lethal dosage determinations for neutrons in mice; the collection and radiosensitivity of the giant multinucleated amoeba, Pelomyxa palustris; the physiological effects and the protective effects of 3-amino-1,2,4-triazole against radiation injuries in mice; development of a procedure for the quantitative determination of 3-amino-1,2,4-triazole; the synthesis and metabolism of 3-amino-1,2,4-triazole in mice; the growth characteristics of a chloroleukemia in rats; tracer studies on the tissue distribution of Mn and the effects of a chelating agent, Chel 138, on the removal of Mn from the tissues in rats; and studies on Be toxicology. (For preceding period see ANL-5597.) (C.H.)

4782 OSR-TR-56-19
Zurich. Universitat.
EFFECTS ON LIVING TISSUES BY PRIMARY COSMIC RAY PARTICLES. Jakob A. G. Eugster. Feb. 1956. 37p. Contract AF 61(514)-898. (AD-87528).

Results are presented from a series of experiments designed to determine the effects of cosmic rays on the living tissues of humans and animals. Excised tissues were exposed at the Jungfraujoch at an altitude of 11,000 ft; in the Simplon Tunnel 8,000 ft below the mountain top, and during the flights of high-altitude and stratosphere balloons. Observations are reported which were made on the tissues following high-altitude exposures and following the reimplantation of the exposed tissues in the parent organisms. It is concluded that harmful effects occur extremely rarely. (C.H.)

4783 USNRDL-TR-122
Naval Radiological Defense Lab., San Francisco.
BACTERIOLOGICAL STUDIES ON MICE EXPOSED TO SUPRALETHAL DOSES OF IONIZING RADIATIONS. I. RADIATION FROM A NUCLEAR SOURCE. II. FAST NEUTRON AND X-RADIATION FROM LABORATORY SOURCES. M. S. Silverman, V. P. Bond, V. Groenman, and P. H. Chin. Nov. 20, 1956. 26p. Project NM 006-015.

Part I of the present report describes experiments in which mice exposed to supralethal doses of neutron or combined neutron and gamma radiation from a nuclear source died, within 4 days, from gastrointestinal injury. Bacteriological examination of the moribund animals revealed that 78 per cent of the former group and 96 per cent of the latter group were infected with bacteria normally confined to the intestinal tract. The majority of animals were infected with 2 or more organisms. Bacteria were isolated from the spleen only in a large per cent of the infected animals. In the study summarized in Part II of this report it was found that, following exposure of mice

to 510 rad fast neutron irradiation from the 60-in. Berkeley Cyclotron or to 1340 rad x irradiation, death occurred within 5 days, primarily from gastrointestinal injury. A high percentage of the animals was found to be infected with endogenous enteric bacteria. The incidence of infection roughly paralleled the increase in deaths. During the first 60 hr organisms were isolated primarily from the spleen. After that time, bacteremia was a common finding. Antibiotic treatment with 10 mg of streptomycin and 4000 units of penicillin at daily intervals decreased the incidence of infection but had no effect on either the mortality or the survival time. Hence, infection is considered to play only a minor role, if any, in the death of animals following exposure to supralethal doses of ionizing radiation. (auth)

4784

INFLUENCE OF AGE, DOSAGE AND SURVIVAL ON EFFECTS OF MULTIPLE INTRAVENOUS INJECTIONS OF RADIOACTIVE GOLD COLLOIDS IN DOGS. P. F. Hahn, E. L. Carothers, Andrew H. Jackson, Frank E. Staggers, and Marvin A. Jackson (Meharry Medical Coll., Nashville, Tenn.). Am. J. Roentgenol. Radium Therapy Nuclear Medicine 77, 476-85(1957) March.

4785

BIOLOGICAL EFFECTS OF FAST NEUTRONS AND GAMMA RAYS. John W. Clark, Donn L. Jordan, and Howard H. Vogel, Jr. (Argonne National Lab., Lemont, Ill.). Am. J. Roentgenol. Radium Therapy Nuclear Medicine 77, 524-30 (1957) March.

4786

QUANTITATIVE OBSERVATIONS ON RECOVERY FROM WHOLE BODY IRRADIATION IN MICE. II. RECOVERY DURING AND AFTER DAILY IRRADIATION. R. H. Mole (Atomic Energy Research Establishment, Harwell). Brit. J. Radiol. 30, 40-6(1957) Jan.

4787

THE GENETIC SIGNIFICANCE OF RADIATION EXPOSURE IN ATOMIC ENERGY WORK IN THE UNITED KINGDOM IN 1953 AND 1954. F. R. Farmer (U.K.A.E.A., Risley, Warrington, Lances). Brit. J. Radiol. 30, 83-5(1957) Feb.

Information is summarized on whole-body x radiation exposures received by employees of the Atomic Energy Authority during 1953 and 1954. The total exposure per year received by employees of the Authority weighted according to their expectation of parenthood is assessed as 4357 roentgen-effective-genetic (reg) units. This is 0.09% of the reg exposure per year now received by the population of Great Britain due to natural radiation. (C.H.)

4788

COMPARISON OF THE INHIBITION OF GOITROGENESIS IN THE RAT PRODUCED BY X-RAYS AND RADIOACTIVE IODINE. John D. Abbatt, I. Doniach, P. Howard-Flanders, and J. H. Logothetopoulos (Hammersmith Hospital, London). Brit. J. Radiol. 30, 86-8(1957) Feb.

4789

THE EFFECT OF X RAYS ON THE UPTAKE OF ^{32}P BY THE KNEE JOINT AND TIBIA OF SIX-WEEK-OLD MICE. A COMPARISON OF THE EFFECTS PRODUCED BY EQUAL DOSES OF 200 kv AND 2 Mev X RAYS. C. W. Wilson (Westminister Hospital, London). Brit. J. Radiol. 30, 92-4(1957) Feb.

4790

RADIOSENSITIVITY OF PITUITARY GLANDS IN TOTAL BODY IRRADIATION OF AMPHIBIANS. E. Ya. Graevskii and A. A. Neifakh (Severtsov Inst. of Animal Morphology). Doklady Akad. Nauk S.S.S.R. 111, 1004-6(1956) Dec. 11. (In Russian)

4791

THE EFFECT OF WHOLE BODY RÖNTGEN IRRADIATION ON THE MEGAKARYOCYTIC SYSTEM IN RAT FEMUR. Bo Lindell and J. Zajicek (Inst. of Radiophysics and Inst. of Radiopathology, Stockholm). Experientia 13, 27-8(1957) Jan.

4792

X-RAY EFFECTS ON HEMOLYSIN FORMATION IN RABBITS WITH THE SPLEEN SHIELDED OR IRRADIATED. William H. Taliaferro and Lucy Graves Taliaferro (Univ. of Chicago, Ill.). J. Infectious Diseases 99, 109-28(1956) Sept.-Oct.

4793

THE DISTRIBUTION AND IN SITU GROWTH PATTERN OF INJECTED RAT MARROW IN X-IRRADIATED MICE. Peter C. Nowell, Leonard J. Cole, Patricia L. Roan, and John G. Habermeyer (U. S. Naval Radiological Defense Lab., San Francisco, Calif.). J. Natl. Cancer Inst. 18, 127-43 (1957) Jan.

4794

IN VITRO SENSITIVITY OF HUMAN LEUKEMIC CELLS TO X-RAYS. Robert Schrek, Stanley L. Leithold, and Irving A. Friedman (Veterans Administration Hospital, Hines, Ill.). Proc. Soc. Exptl. Biol. Med. 94, 250-3(1957) Feb.

RADIATION HAZARDS AND PROTECTION

4795 NYO-4751(Rev.)

New York Operations Office. Health and Safety Lab., AEC.

SUMMARY OF ANALYTICAL RESULTS FROM THE HASL STRONTIUM PROGRAM TO JUNE 1956. John H. Harley, Edward P. Hardy, Jr., George A. Welford, Ira B. Whitney, and Merril Eisenbud. Aug. 31, 1956. 38p. $0.30(OTS).

An abstract of the unrevised version of this report appears as NSA 11-3480. The revised version incorporates additional analytical data. (C.H.)

4796

RADIUM CAPSULES AND THEIR ASSOCIATED HAZARDS. Robert G. Gallagher and Eugene L. Saenger (Univ. of Cincinnati and the Children's Hospital, Ohio). Am. J. Roentgenol. Radium Therapy Nuclear Medicine 77, 511-23 (1957) March.

4797

EXPERIMENTAL AND CLINICAL RESEARCH ON THE RADIO-PROTECTIVE ACTION OF CYSTEAMINE AND CYSTAMINE. II. EXPERIMENTAL RESEARCH UPON MAMMALS. G. Baldini and L. Ferri (Univ. of Pavia, Italy). Brit. J. Radiol. 30, 95-8(1957) Feb.

RADIOTHERAPY

4798

THE ROLE OF RADIOACTIVE ISOTOPES IN CARCINOMA OF THE MAXILLARY ANTRUM. Arthur G. James (Ohio State Univ. Medical Center, Columbus). Am. J. Roentgenol. Radium Therapy Nuclear Medicine 77, 415-20(1957) March.

4799

TREATMENT OF MALIGNANT EFFUSIONS BY INTRACAVITARY INJECTION OF RADIOACTIVE COLLOIDAL GOLD. Chu H. Chang, Arnold H. Janzen, Alan B. Skorneck, and Paul J. Rosenbaum (Yale Univ. School of Medicine and Grace-New Haven Community Hospital, New Haven, Conn.). Am J. Roentgenol. Radium Therapy Nuclear Medicine 77, 486-92(1957) March.

4800
RADIATION THERAPY: A GENERAL THEORY. J. Robert Andrews (U. S. Dept. of Health, Education and Welfare, Bethesda, Md.). Am. J. Roentgenol. Radium Therapy Nuclear Medicine 77, 531-9(1957) March.

4801
A QUANTITATIVE STUDY OF THE RADIOSENSITIVITY OF CHRONIC LEUKAEMIA. E. C. Easson (The Christie Hospital and Holt Radium Inst., Manchester, Eng.). Brit. J. Radiol. 30, 35-9(1957) Jan.

TOXICOLOGY STUDIES

4802 MLM-961
Mound Lab., Miamisburg, Ohio.
THE EFFECTS OF REPEATED POLONIUM INJECTIONS ON RATS. I. GROSS EFFECTS AND METABOLISM OF 2 μC/Kg DOSES. R. K. Davis, W. T. Rockhold, and D. S. Anthony. Apr. 9, 1954. 31p. Contract AT-33-1-GEN-53. $0.25(OTS).

A large number of rats were injected with multiple doses of polonium, averaging about 2.0 microcuries per kilogram of body weight, and these injections were repeated at 14 day intervals. The rats were serially sacrificed for tissue analysis. The blood and excreta of the living rats were analyzed periodically for polonium content. Food and water intake and body weight changes were recorded. Results of this experiment are presented in graphical form (auth)

4803 AEC-tr-2842
EFFECT OF TOLYLENE DIISOCYANATE (DESMODUR T) ON THE RESPIRATORY PASSAGES. (Zur Wirkung von Toluylendiisocyanat (Desmodur T) auf die Atemwege). H. Friebel and H. Lüchtrath. Translated from Naunyn-Schmiedeberg's Arch. exptl. Pathol. Pharmakol. 227, 93-110(1955). 30p.

TRACER APPLICATIONS

4804 TID-7512
Michigan State Univ., East Lansing.
A CONFERENCE ON RADIOACTIVE ISOTOPES IN AGRICULTURE HELD AT MICHIGAN STATE UNIVERSITY ON JANUARY 12, 13, and 14, 1956. Jan. 1956. 420p. $3.00(GPO).

Forty-eight papers presented at this Conference are included. In addition to seven summary papers, topics covered include the following: waste disposal in agricultural research installations; radiobiological studies; new techniques in tracer use; the role of radioactive materials in testing herbicides and fungicides in plants and soils; ionizing radiation in food preservation; mechanisms of mineral uptake in plants; nitrogen and organic matter transformation in soils; and lactation studies. An author index is included. (C.H.)

4805 UR-476
Rochester, N. Y. Univ. Atomic Energy Project.
EFFECT OF DIFFERENT IMMUNIZATION PROCEDURES ON ORGAN SPECIFIC ANTIBODY PRODUCTION. Ruth L. Goodland, Dolores E. Wolfe, Arthur Grimaldi, Irving L. Spar, and William F. Bale. Jan. 17, 1957. 18p. Contract W-7401-eng-49. $3.30(ph OTS); $2.40(mf OTS).

4806 AEC-tr-2845
METHOD FOR DETERMINING TRITIATED WATER AND ITS APPLICATIONS IN CLINICAL PRACTICE. P. Fallot, A. Aeberhardt, and J. Masson. Translated by K. S. Bevis from Intern. J. Appl. Radiation Isotopes 1, 237-45(1957). 15p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 11-3677. (W.L.H.)

4807
ON THE RETENTION AND TRANSLOCATION OF Ra^{224}(Th X) IN DOGS. Marvin A. Van Dilla, Betsy J. Stover, and James S. Arnold (Univ. of Utah, Salt Lake City). Am. J. Roentgenol. Radium Therapy Nuclear Medicine 77, 503-10(1957) March.

4808
COMPARATIVE METABOLISM OF Ca^{45} AND Ra^{226}. B. J. Stover, D. R. Atherton, and J. S. Arnold (Univ. of Utah, Salt Lake City). Proc. Soc. Exptl. Biol. Med. 94, 269-72 (1957) Feb.

4809
FACTORS INFLUENCING EXCRETORY PATTERNS OF CESIUM-134, POTASSIUM-42 AND RUBIDIUM-86 IN RATS. Frank R. Mraz and Homer Patrick (Univ. of Tennessee, Knoxville). Proc. Soc. Exptl. Biol. Med. 94, 409-12 (1957) Feb.

CHEMISTRY

4810 ISC-757
Ames Lab., Ames, Iowa.
SEMI-ANNUAL SUMMARY RESEARCH REPORT IN CHEMISTRY FOR JANUARY–JUNE 1956. Oct. 12, 1956. 61p. Contract W-7405-eng-82. $0.40(OTS).

Progress is reported on the following studies: separation of rare earths by ion exchange, production and properties of rare earth metals, preparation of Eu, chemistry of Ga, corrosion studies, determination of Th in pure Ce, and exchange reactions. (For preceding period see ISC-706.) (W.L.H.)

4811 KAPL-1667
Knolls Atomic Power Lab., Schenectady, N. Y.
THE LITHIUM HYDRIDE, DEUTERIDE, AND TRITIDE SYSTEMS. F. K. Heumann and O. N. Salmon. Dec. 1, 1956. 54p. Contract W-31-109-Eng-52. $0.40(OTS).

Pressure-composition isotherms have been experimentally determined at 700°C for the LiH, LiD, and LiT systems. Isotherms for LiD and LiT at 750°C and 800°C have also been determined. The immiscibility loops for the LiH–Li, LiD–Li, and LiT–Li systems have been calculated. Several equations have been derived which make it possible to calculate the isotherms at all points exclusive of the plateau and also to calculate the breaks (plateau limits) for isotherms at any temperature. The heats of formation of LiH, LiD, and LiT have been determined at temperatures between 700°C and 800°C. The values for free energy and entropy have also been determined at these temperatures. (auth)

4812 NAA-SR-1797
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
BASIC CHEMISTRY OF HIGH TEMPERATURE INORGANIC SYSTEMS. Semiannual Progress Report [for] January–June 1956. S. J. Yosim and T. A. Milne. Mar. 1, 1957. 23p. Contract AT-11-1-GEN-8. $0.25(OTS).

Experiments on the vapor pressure of Th and ThF_4 are described. The vapor pressure of ThF_4 from 1128° to 1311°K is log P(atm.) = -18,740/T (°K) + 10.51. Studies of ThI_4 thermal stability, and solubility and thermodynamic activity of Bi–$BiCl_3$ and U–UCl_3 systems are reported. (For preceding period see NAA-SR-1603.) (T.R.H.)

4813 UCRL-3568
California. Univ., Berkeley. Radiation Lab.
ABSORPTION SPECTRA OF AROMATIC DISULFIDES.

Antonino Fava and Melvin Calvin. Oct. 31, 1956. 9p. Contract W-7405-Eng-48. $0.15(OTS).

4814 UCRL-3629

California. Univ., Berkeley. Radiation Lab.

CHEMISTRY DIVISION QUARTERLY REPORT [FOR] SEPTEMBER, OCTOBER, NOVEMBER 1956. Jan. 2, 1957. 85p. Contract W-7405-eng-48. $0.50(OTS).

Bio-Organic Chemistry. The studies in progress include: structure of vanadyl chelates, isotope effects in reversible oxygenation of Co chelates, electron spin resonance of choline chloride and analogs, C^{14}-ion irradiations, C^{14} assay in organic compounds, growth of algae in D_2O, algae carotenoid content in light and dark, morphine synthesis and biosynthesis, dark fixation of $C^{14}O_2$ by algae, radioactivity of chlorophyll a and b from photosynthetic studies, effect of DFP on cholinesterase, biochemical factors in maze learning, a radiometric Warburg apparatus, insulin assay using C^{14} respiratory patterns, respiratory C^{14} patterns for D- and DL-leucine and norleucine. Nuclear Chemistry. Investigations are reported in decay of Eu^{154} and Eu^{155}, electron-capture decay of Gd^{151}, $\alpha-\gamma$ coincidence spectra of Ra^{223}, new Dy isotopes, search for S^{38}, selection rules for γ-transitions in highly deformed spheroidal nuclei, paramagnetic resonance of Cm. Chemical Engineering. Brief notes on work in progress are given. General Chemistry. Progress is reported in Ru chemistry, heat of formation of ferrate ion, O^{17} relaxation by paramagnetic ions, O^{17} chemical shifts, P_4S_3 chemical shifts and spin-spin interactions. (For preceding period see UCRL-3595.) (T.R.H.)

4815 AEC-tr-2510

'INORGANIC BENZENE' $B_3N_3H_6$ AND ITS METHYL HOMOLOGUES. Egon Wiberg. Translated from Naturwissenschaften 35, 182-8(1948). 24p.

The chemical properties, structure, physical properties, preparation, and mechanism of formation of borazole and its methyl homologues are given and discussed. (T.R.H.)

4816 AEC-tr-2843

ALUMINA SOLUTIONS CONTAINING SODIUM AND THE "DECOMPOSITION" OF THE SOLUTIONS. E. Calvet, H. Thibon, A. Maillard, and P. Boivinet. Translated by K. S. Bevis from Bull. soc. chim. France 17, 1308-12 (1950). 11p.

4817 AF-TR-6145(Pt. III)

Battelle Memorial Inst., Columbus, Ohio.

THE EXPERIMENTAL MEASUREMENT OF THERMAL CONDUCTIVITIES, SPECIFIC HEATS, AND DENSITIES OF METALLIC, TRANSPARENT, AND PROTECTIVE MATERIALS. PART III. C. F. Lucks, J. Matolich, and J. A. Van Velzor. Mar. 1954. 78p. Project No. 1367. Contract AF33(616)-311. (AD-95406).

Measurements of the thermal conductivities of clear plate glass, Solex 2808X plate glass, and Solex "S" plate glass from 150 to 450°C, and of clear fused silica (quartz) and Vycor from 150 to 800°C, are reported. Specific-heat measurements have been made on K-Monel, Inconel, Inconel X, stainless steel Types 301, 316, and 347, and SAE 1010 mild steel from −200 to 850°C; on Mg alloy Type AN-M-29 from −200 to 350°C; on Al alloys Types 24S-T4 and 75S-T6 from −200 to 450°C; on clear fused silica (quartz) and Vycor from −200 to 800°C; on clear plate glass, Pyrex Type 774 glass, Solex "S" plate glass, and Solex 2808X plate glass from −200 to 500°C; and on Plexiglass Type AN-P-44A from −200 to 100°C. (auth)

4818

NITROGEN ISOTOPE EFFECT IN THE DISTILLATION OF N_2O_4. G. M. Begun (Oak Ridge National Lab., Tenn.). J. Chem. Phys. 25, 1279-80(1956) Dec.

4819

TABLES OF CHEMICAL KINETICS. HOMOGENEOUS REACTIONS. SUPPLEMENT 1 TO NBS CIRCULAR 510. Charles H. Stauffer. Natl. Bur. Standards(U. S.), Circ. 510, Suppl. 1, 1956. 486p. Price $3.25(GPO).

Refer also to abstract 5024.

ANALYTICAL PROCEDURES

4820 CCC-1024-TR-223

Pittsburgh. Univ.

DETERMINATION OF BORON IN BORON HYDRIDES AND DERIVATIVES BY THE CARMINE METHOD. W. H. Hill, J. M. Merrill, and B. J. Palm. Feb. 4, 1957. 10p. [For Callery Chemical Co. Contract NOa(s)52-1024-c.]

The carmine method for the determination of 1 to 10 micrograms of B was applied to dimethylamine-borane, trimethylamine-borane, pyridine-borane, and decarborane. The color produced upon addition of carmine in concentrated H_2SO_4 is measured with a spectrophotometer. The non-specific method does not differentiate between B in B hydrides and in $B(OH)_3$ or B_2O_3. (auth)

4821 IDO-14393

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

DETERMINATION OF URANIUM IN SOLUTION BY X-RAY SPECTROMETRY. Harry M. Wilson and G. V. Wheeler. Jan. 30, 1957. 19p. Contract AT(10-1)-205. $0.20(OTS).

A rapid precise method for the determination of U in HNO_3 solution is presented. The U in solution is excited by a primary x-ray beam from a Mo tube. The intensity of the fluorescent U $L\alpha_1$ line is measured by means of a crystal spectrometer employing a scintillation counter and pulse height analyzer. This intensity is converted to concentration by relating to standard solutions. The modifications of commercial equipment that simplified the solution analysis are described as are comparisons of various instrument components. (auth)

4822 KAPL-1648

Knolls Atomic Power Lab., Schenectady, N. Y.

GAMMA ABSORPTIOMETRIC SEDIMENTATION ANALYSIS IN LIQUID METAL−SOLID OXIDE SYSTEMS. S. C. Furman. Jan. 8, 1957. 16p. Contract W-31-109-Eng-52. $0.20(OTS).

A method was developed for determining the concentration and the rate of settling of particulate U compounds in NaK or Na. The method depends on the difference between absorption of gamma radiation by the U compound and that by the Na. The low energy gamma emitter, Se-75, was used to discriminate between UO_2 and Na at concentrations in the range of 5 to 30 wt. %. (auth)

4823 NBS-4708

National Bureau of Standards, Washington, D. C.

THE PREPARATION AND ANALYSIS OF C^{14}-LABELED CYANIDE. Joseph D. Moyer and Horace S. Isbell. June 20, 1956. 21p. $0.25(OTS).

4824 NP-6225

Canada. Dept. of Mines.

ACCURATE X-RAY FLUORESCENCE ANALYSIS WITHOUT INTERNAL STANDARD. Fernand Claisse. May 1956. 26p. (PR-327).

The preparation of ores, minerals and other chemical compounds for the analysis by an x-ray fluorescence method in which no internal standard is used is described. The method is rapid, accurate and almost universal in that it can be used for most elements without any difference in the procedure. Theoretical considerations and examples of results obtained are included. (auth)

4825 NYO-3976
Johns Hopkins Univ., Baltimore.
ABSORPTION COEFFICIENTS FOR THE ULTRAVIOLET HNO_2 ABSORPTION BANDS. Charles Petty. Oct. 26, 1954. 15p. Contract AT(30-1)-1447. $3.30(ph OTS); $2.40(mf OTS).

Absorption coefficients have been assigned to the HNO_2 molecule from photoelectric absorption measurements in the region 3300 to 3900A for the gaseous mixture of NO, NO_2, and H_2O. The concentration of HNO_2 was calculated from available equilibrium data, and correction was made for the absorption due to NO_2. Two different relative concentrations of the constituent vapors were used yielding essentially the same absorption coefficients. Isotopic substitution experiments were conducted with D_2O substituted for H_2O in the gaseous mixture. Isotope shifts in the absorption spectrum were noted which were in essential agreement with those reported by Porter. (auth)

4826 RAE-R-MET-86
Gt. Brit. Royal Aircraft Establishment, Farnborough, Hants, England.
A LOW-PRESSURE MICRO-ANALYTICAL METHOD FOR DETERMINING OXYGEN, HYDROGEN AND NITROGEN IN METALS. H. C. Davis and J. A. Gray. Mar. 1955. 15p. (AD-72550).

A low-pressure microanalytical method for the determination of O_2, H_2, and N_2 in metals is described. Gases evolved by vacuum-fusion are analyzed physically. The results obtained for O_2 and H_2 are closely reproducible, but those for N_2 are less so. (auth)

4827 AEC-tr-2675
LACTO-FLAVIN (VITAMIN B_2). R. Kuhn, H. Rudy, and T. Wagner- Jauregg. Translated by F. Hudswell from Ber. deut. chem. Ges. 66, 1950-6(1933). 11p.

4828 AEC-tr-2829
STUDY OF CADMIUM CYANIDE COMPLEX SALTS BY POLAROGRAPHIC AND ELECTROMETRIC ANALYSIS. S. N. Fleggas. Translated from Chim. Chronika 20A, 127-35(1955). 19p.

4829
THE ABSORPTIOMETRIC DETERMINATION OF MICROGRAM QUANTITIES OF URANIUM WITH THE THORONOL COMPLEX OF QUADRIVALENT URANIUM. J. K. Foreman, C. J. Riley, and T. D. Smith (U. K. Atomic Energy Authority, Windscale Works, Sellafield). Analyst 82, 89-95(1957) Feb.

In dilute acid solution U^{4+} forms a red complex with thoronol. The complex is stable in aqueous acetone solution and affords a sensitive and precise method of determining microgram quantities of U. Several elements interfere and to overcome this a method of separation has been developed in which U is extracted as its sodium diethyldithiocarbamate complex with chloroform. Cupferron and ethylenediaminetetra-acetic acid are used to hold back impurities. (auth)

4830
CHROMATOGRAPHIC SEPARATIONS IN PHENOL–METHANOL–HYDROCHLORIC ACID SOLVENTS, WITH SPECIAL REFERENCE TO THE ALKALI METALS. Robert J. Magee and James B. Headridge (The Univ. Edinburgh). Analyst 82, 95-101(1957) Feb.

A $C_6H_5OH-CH_3OH-HCl$ mixture (57.5: 22.5: 20% w/v/v) has been used to separate the chlorides of Li and Na, and of K, Rb, Cs and NH_4^+. Zinc uranyl acetate has been employed for the detection and determination of 0.25 to 10 μM (micromoles) of Li and 0.1 to 10 μM of Na, and sodium lead cobaltous hexanitrite for 0.1 to 10 μM of K, Rb and Cs and 0.25 to 10μM of NH_4^+. It was found that 10-μM amounts of any of the group IA metals, singly or combined, did not interfere with the detection and determination of the minimum amounts of any particular metal. A $C_6H_5OH-CH_3OH-HCl$ (50: 20: 30% w/v/v) has been used to separate small amounts of Al, Ga, In, Tl and Zn, and Ti, Zr and Fe. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

4831 LA-2076
Los Alamos Scientific Lab., N. Mex.
THE PREPARATION OF URANIUM DIOXIDE CRYSTALS. R. J. Bard and D. F. Bowersox. July 1956. 31p. Contract W-7405-eng-36. $0.25(OTS).

DEUTERIUM AND DEUTERIUM COMPOUNDS

4832 NBS-4877
National Bureau of Standards, Washington, D. C.
A REVIEW OF THE REACTION KINETICS OF DEUTERIUM AND TRITIUM COMPOUNDS. VII. OXIDATION-REDUCTION REACTIONS. Lawrence M. Brown. Nov. 1, 1956. 27p.

A review of the kinetics of oxidation-reduction reactions of deuterium and tritium compounds has been prepared for the period 1932 to 1955. The experimental data are summarized in five tables. Fifty-two references are cited. (auth)

FLUORINE AND FLUORINE COMPOUNDS

4833 IGR-TN/CA-457
Gt. Brit. Capenhurst Works, Ches., England.
LIQUID–VAPOUR EQUILIBRIA IN THE SYSTEM CHLORINE TRIFLUORIDE–HYDROGEN FLUORIDE. J. F. Ellis and C. W. Forrest. Feb. 1957. 5p.

The phase diagram for liquid-vapor equilibria in the system ClF_3-HF at 20°C has been established. There is an azeotrope of maximum total vapor pressure at a composition of 0.26 molar fraction HF. (auth)

4834
ULTRA-VIOLET BAND SYSTEMS OF HF^+ AND DF^+. J. W. C. Johns and R. F. Barrow (Univ. of Oxford, Eng.). Nature 179, 374(1957) Feb. 16.

It was found that the ultraviolet systems of HF^+ and DF^+ may be excited reproducibly in hollow-cathode discharges in the presence of a few millimeters pressure of He. Data concerning these band systems are tabulated. (B.J.H.)

4835
NOTE ON THE ISOTOPIC EFFECT IN THE FRACTIONAL DECOMPOSITION OF POTASSIUM FLUOBORATE. Maurice D'Hont and Andre de Lattre (C. E. A. N., Mol, Belgium). Nuclear Phys. 2, 736(1957) Feb.

GRAPHITE

4836
USE OF GRAPHITE IN THE ATOMIC ENERGY PROGRAM. John F. Fletcher and Wayne A. Snyder (Hanford Atomic Products Operation, Richland, Wash.). Am. Ceram. Soc. Bull. 36, 101-4(1957) March.

In considering the use of graphite in a reactor, allowance must be made for the changes in physical properties which are induced in the graphite by neutron bombardment. Graphite irradiated at 30°C in a reactor undergoes changes in its physical properties which are, for the most part, deleterious in nature. The changes are temperature dependent. Radiation damage graphite may be annealed thermally; essentially complete recovery of properties may be realized at high annealing temperatures. Data are given on changes

in physical properties occurring in typical graphites upon irradiation at temperatures from 30° to 150°C. Variations in graphite types which affect changes in physical properties are pointed out. (auth)

LABORATORIES AND EQUIPMENT

4837 KAPL-M-DDL-1
Knolls Atomic Power Lab., Schenectady, N. Y.
A HOT LABORATORY FACILITY FOR REMOTE METALLOGRAPHY. D. D. LaRocque and F. P. Crimi. [Mar. 1957]. 16p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The modifications that were made to "remotize" commercially available equipment for remote metallography, the approximate costs, and the operations and results obtained with the equipment are discussed. (auth)

4838
LABORATORY GAS COMPRESSOR FOR PRESSURES UP TO 3000 PSI. F. J. Edeskuty (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 28, 142-3(1957) Feb.

RADIATION EFFECTS

4839
ON THE NATURE OF THE CLOTTING DEFECT IN IRRADIATED FIBRINOGEN. P. Rieser and R. J. Rutman (Univ. of Pennsylvania, Philadelphia). Arch. Biochem. Biophys. 66, 247-9(1957) Jan.

RARE EARTHS AND RARE-EARTH COMPOUNDS

4840 AEC-tr-2826
HALIDES. J. J. Berzelius. Translated from Ann. Phys. Chem. (2), 92, 403-6(1829). 3p.

The preparation and some properties of $ThCl_4$, $ThBr_4$, ThF_4, thorium–potassium fluoride, and iron–thorium cyanide are briefly discussed. (W.L.H.)

SEPARATION PROCEDURES

4841 CF-57-2-37
Oak Ridge National Lab., Tenn.
EXTRACTION OF METAL IONS WITH Di-2-ETHYLHEXYL PHOSPHORIC ACID. J. C. White. Feb. 8, 1957. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Tests have shown that di-2-ethylhexyl phosphoric acid is a relatively specific extractant for metal ions. The mechanism postulated for this organic reagent for the extraction of metallic ion, M^{2+} is: $M^{2+}(aq) + 2HR_2PO_4(org) \rightarrow M(R_2PO_4)_2(org) + 2H^+(aq)$. (W.L.H.)

4842 DOW-91
Dow Chemical Co. Western Div., Pittsburg, Calif.
PROGRESS REPORT [FOR] DECEMBER [1952]. Research Dept. R. H. Bailes. Jan. 8, 1953. Decl. Sept. 29, 1955. 55p. Contract AT-30-1-Gen-236.

The use of octyl phosphoric acid and octyl pyrophosphoric acid in a hydrocarbon diluent for solvent extraction of U and V from carnotite ores and U from normal superphosphate is described. (auth)

4843 ISC-703
Ames Lab., Ames, Iowa.
THE FORMATION OF THALLIUM CHLORIDE COMPLEXES AND THEIR EXTRACTION INTO ETHER. Donald Leonard Horrocks and A. Voigt. Nov. 1955. 78p. Contract W-7405-eng-82. $0.45(OTS).

The extraction of thallium chloride complexes from acids under various conditions using isopropyl ether as the extractant is presented. The empirical formula of the Tl compound in the ether phase was found to be $HTlCl_4$ and the equilibrium constant for the extraction process was determined. (W.L.H.)

4844
AN ANION-EXCHANGER PROCESS FOR GRAM-SCALE SEPARATION OF AMERICIUM FROM RARE EARTHS. J. S. Coleman, R. A. Penneman, T. K. Keenan, L. E. Lamar, D. E. Armstrong, and L. B. Asprey (Los Alamos Scientific Lab., N. Mex.). J. Inorg. and Nuclear Chem. 3, 327-8(1956).

TRANSURANIC ELEMENTS AND COMPOUNDS

Refer to abstract 4843.

TRITIUM AND TRITIUM COMPOUNDS

Refer to abstract 4832.

URANIUM AND URANIUM COMPOUNDS

4845 HW-42996
General Electric Co., [Hanford Atomic Products Operation, Richland, Wash.]
TEMPERATURE CALCULATIONS FOR UO_2 FIT TOLERANCE EXPERIMENT. W. E. Roake. May 9, 1956. Decl. Mar. 7, 1957. 11p. Contract [W-31-109-Eng-52]. $3.30 (ph OTS); $2.40(mf OTS).

Two capsules containing UO_2 with variable gap between oxide and jacket have been prepared in an effort to gain some understanding of the need for close dimensional tolerances. The range of gap is 0.001 to 0.011 in. These capsules are to be irradiated in the MTR and will be referred to as test GEH-3-19. The calculation of expected temperatures and desired irradiation conditions is given. (auth)

Refer also to abstract 4831.

ENGINEERING

4846 ANL-5669
Argonne National Lab., Lemont, Ill.
DEVELOPMENT AND OPERATION OF AN AUTOMATIC PRESS FOR CERAMIC POWDERS. R. A. Bach, O. E. Layton, and J. H. Handwerk. Jan. 1957. 10p. Contract W-31-109-eng-38. $0.15(OTS).

The construction of a small automatic pelleting press is described. Details of the piping and timing mechanism are discussed. The sequence of operation is given and some details of the granulation procedure used for preparing powders for the press are discussed. (auth)

4847 ORNL-2110
Oak Ridge National Lab., Tenn.
ANALYSIS AND DESIGN OF THE FROZEN SEAL. J. F. Bailey. Mar. 8, 1957. 11p. Contract W-7405-eng-26. $0.20(OTS).

HEAT TRANSFER AND FLUID FLOW

4848 CF-57-1-100
Oak Ridge National Lab., Tenn.
THERMAL CHARACTERISTICS OF A DELTA ARRAY HEAT EXCHANGER. J. L. Wantland. Jan. 28, 1957. 20p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40 (mf OTS).

The heat transfer and fluid friction characteristics have been determined for a liquid flowing parallel to the tube bundle of a heat exchanger consisting of one hundred and two $\frac{1}{16}$-inch O.D. tubes arranged in a delta or triangular array. These results may be expressed by the following empirical equations: From N_{Re} = 900 to N_{Re} = 2,300, $N_{Nu}/N_{Pr}^{0.4} = 0.47\ N_{Re}^{0.36}$ and, from N_{Re} = 2,300 to N_{Re} = 13,000, $N_{Nu}/N_{Pr}^{0.4} = 0.066\ N_{Re}^{0.91}$. From N_{Re} = 900 to N_{Re} = 13,000, $f = 90/N_{Re} + 0.033$, where f is defined by $f = (\Delta P)/((L/D_w)(pu^2/2g_c))$. (auth)

4849 TID-3305
Technical Information Service Extension, AEC.
HEAT TRANSFER: A BIBLIOGRAPHY OF UNCLASSIFIED REPORT LITERATURE. James M. Jacobs and Gifford A. Young, comps. Mar. 1957. 177p. $1.00(OTS).

This bibliography contains 1031 annotated references to unclassified reports on heat transfer held by the Technical Information Service Extension, Oak Ridge, as of July 18, 1956. Author, subject, and report number availability indexes are included. (auth)

MATERIALS TESTING

4850 CRLR-488
Chemical and Radiological Labs., Army Chemical Center, Md.
INVESTIGATION OF THE VACUUM-FORMING PROCESS FOR PLASTICS FABRICATION. Harrison Gross and Warren L. Price. Jan. 6, 1955. 15p. Project 4-91-06-002.

Work accomplished to compare technical operational data for efficient vacuum forming of various thermoplastic materials is reported. Tables and graphs are included showing the vacuum-forming properties of various materials and the conditions required for their most effective employment. (auth)

4851 WADC-TR-56-430(Pt. 1)
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
THE EFFECTS OF NUCLEAR RADIATION ON MILITARY SPECIFICATION GREASES. Period covered: January 1955 to August 1956. William L. R. Rice. Dec. 1956. Oct. 26, 1956. 28p. Contract Project title: ANPP SUPPORT. Task title: NUCLEAR RADIATION STABILITY OF ORGANIC FLUIDS AND GREASES. (AD-110644).

An investigation was made of the effects of gamma radiation on available specification and non-specification greases. Data are presented on the effects of gamma radiation on forty-seven greases. Many of the greases tested appear to be satisfactory for use after exposure to about 1×10^8 roentgens, the screening dosage used for these studies. (auth)

4852
EFFECT OF PLASTIC FATIGUE ON PRESSURE-VESSEL MATERIALS AND DESIGN. L. F. Kooistra (The Babcock & Wilcox Co., Alliance, Ohio). Welding J. (N. Y.) 36, 120s-30s(1957) March.

Compiled data have been correlated to establish the parameters governing pressure-vessel design with respect to the plastic fatigue characteristics of the material. Testing methods have been evaluated for determining "Plastic Endurance" as a characteristic of the material itself, as well as methods for establishing for the "Effective Strain Concentration Factor" of various plate surface conditions, notches, attachments and the effect of welding. General conclusions for the practical application of the findings toward setting up safe design limits, as well as recommendations for further research, are presented. (auth)

4853
PROPERTIES AND WELDABILITY OF HIGH-STRENGTH PRESSURE-VESSEL STEELS IN HEAVY SECTIONS. J. H. Gross and R. D. Stout (Lehigh Univ., Bethlehem, Pa.). Welding J. (N. Y.) 36, 157s-67s(1957) March.

The effects of plate thickness and of position in the plate on the mechanical properties and weldability of high-strength pressure-vessel steels in heavy sections are studied. (T.R.H.)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

4854 NP-6206
Bartol Research Foundation, Swarthmore, Penna.
ELECTRICAL PROPERTIES OF THORIUM OXIDE AND SIMILAR MATERIALS AT HIGH TEMPERATURE. Final Report [for] November 1, 1953–January 31, 1957. W. E. Danforth. Feb. 15, 1957. 15p. Project TB2-001 (718). Contract DA-36-034-ORD-1487RD.

Investigations of polarization, electrolysis, and the Hall Effect in ThO_2 crystals subjected to high current densities for long periods are summarized. (D.E.B.)

4855 UCRL-3633
California. Univ., Berkeley. Radiation Lab.
THE STABILITY OF HIGH-TEMPERATURE OXIDES (thesis). Frank Terrance Greene. Jan. 14, 1957. 20p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

Equimolar $Si-SiO_2$ mixtures are investigated by means of high-temperature differential thermal analysis. The heat of fusion of Si is observed in all cases, and is shown to prove the thermodynamic instability of SiO at all temperatures. The ultraviolet spectrum attributed to MgO is investigated by means of intensity change and isotope shift. The responsible species is shown to be an oxide of Mg. (auth)

4856 WADC-TR-56-139
Illinois. Univ., Urbana.
HIGH TEMPERATURE RESISTANT CERAMIC COATINGS OF INCREASED LONG HEAT STABILITY. Karl E. Nelson, Tracy A. Willmore, and Dwight G. Bennett. Dec. 1955. 19p. Project 3066. Contract AF33(616)-2307. (AD-99659).

This final report summarizes the results of a series of tests conducted during an investigation of the effect of composition variables on the performance of ceramic coatings when subjected to a 1600°F cyclic long heat test. It was found that various frit compositions could be reformulated which would produce high-temperature resistant ceramic coatings of increased long heat stability. The modifications in composition which produced eight ceramic coatings having improved performance are described in some detail. Particular attention has been given to the role played by the $BaO-SiO_2$ phase equilibrium diagram in controlling the refractoriness of the ceramic coatings developed during this investigation. (auth)

4857 WADC-TR-56-140
Illinois. Univ., Urbana.
METAL PROTECTIVE AND RADIATION REFLECTIVE CERAMIC COATINGS. Clarence L. Hoenig, Tracy A. Willmore, and Dwight G. Bennett. Jan. 1956. 32p. Project 3066. Contract AF33(616)-2307. (AD-99660).

The objective of the work described was to develop

ceramic coatings that would, in one application, protect heated metal from corrosion and at the same time reflect a significant amount of incident radiant energy. A total of 36 ceramic coatings were prepared in which four matrix, or bonding, glasses and four refractory, radiation-reflective ceramic aggregates were investigated. The radiation-reflective components were fused magnesia, calcined diaspore, stabilized zirconia and calcined ceria. It was found that calcined ceria was superior in properties of wettability stability, low solubility, and sustained radiation reflection during long heating. When used with a matrix glass of proper thermal expansion, ceria aggregate coatings were found to function effectively in a one-coat application on Type 347 stainless steel. It appeared that it would be necessary to develop matrix glasses of some what greater fusibility to permit such coatings to function as well on low alloy steel. (auth)

4858

THORIA AND URANIA BODIES. J. H. Handwerk, L. L. Abernethy, and R. A. Bach (Argonne National Lab., Lemont, Ill.). Am. Ceram. Soc. Bull. 36, 99-101(1957) March.

A technique for fabricating and firing thoria-urania bodies is summarized. Bodies made of urania must be fired in vacuo, in hydrogen, or in an inert gas atmosphere, for urania upon heating in air changes to U_3O_8 with a destructive volume increase. Bodies containing from 30 to 80 wt. % urania with thoria have been fired in air by adding the urania as U_3O_8, which reverts to urania during firing to form stable thoria-urania solid solutions. (auth)

4859

REFRACTORIES FOR MELTING AND CASTING URANIUM AND OTHER METALS. S. D. Stoddard and W. T. Harper (Los Alamos Scientific Lab., N. Mex.). Am. Ceram. Soc. Bull. 36, 105-8(1957) March.

The various pure oxide refractories employed in melting and casting uranium, uranium alloys, and other metals are dixcussed. The purity of the refractories and their methods of fabrication are considered. Coating materials and methods of applying them to molds and crucibles are mentioned. A typical vacuum furnace installation for melting uranium and uranium alloys is described. The various furnace refactory components and their fabrication methods are discussed in detail. (auth)

CORROSION

4860 BMI-1156

Battelle Memorial Inst., Columbus, Ohio.

AQUEOUS CORROSION OF URANIUM FUEL-ELEMENT CORES CONTAINING 0 TO 20 w/o ZIRCONIUM. Daniel R. Grieser and Eugene M. Simons. Jan. 7, 1957. Decl. Feb. 28, 1957. 33p. Contract W-7405-eng-92. $0.40 (OTS).

A description is given of the design and operation of a windowed autoclave system employed in the study of corrosion by pressurized hot water. The device has been used to obtain time-lapse motion pictures of the swelling and rupture of deliberately defected Zr-clad U specimens. A method is described by which corrosion rates were calculated from pressure and temperature measurements. A typical set of pictures taken during a test is presented, and corrosion rates are reported for U–0, 5, 10, 15, and 20 wt. % Zr alloys subjected to 600°F water. (auth)

GEOLOGY AND MINERALOGY

4861 NYO-7699

Massachusetts Inst. of Tech., Cambridge, Mass. Dept. of Metallurgy.

THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS. Progress Report. Oct. 31, 1956. 40p. Contract AT(30-1)-956. (MITS-33). $0.30(OTS).

(For preceding period see NYO-7149.)

4862 RME-1074

Division of Raw Materials. Denver Exploration Branch, AEC.

GEOLOGY OF THE BUSFIELD DEPOSIT IN NORTHWESTERN CROOK COUNTY, WYOMING. Bruce A. MacPherson. July 26, 1956. 14p. $0.20(OTS).

A large deposit of coffinite has recently been discovered in the Fall River formation of Early Cretaceous age in northwestern Crook Co., Wyo. The host sandstone was deposited in a channel or restricted basin existing late in Fall River time. Although the coffinite is found at a relatively shallow depth, it has been protected from oxidation by a body of perched ground water within the paleostream channel. Secondary uranium minerals such as carnotite and metatyuyamunite are present above the coffinite zone but have not been found in minable quantities. Local tectonic structure, although less well defined than the sedimentary structure, may have controlled ore deposition. Core drilling shows that the ore-bearing sandstone begins to thin rapidly at a point where there is also an abrupt change in dip. The possibility that such a restriction could have impeded the ore solutions and contributed to deposition merits consideration. (auth)

4863 RME-2048(Rev.)

Salt Lake Area Office, AEC.

PRELIMINARY REPORT ON A URANIUM OCCURRENCE IN THE ATLANTA AREA, LINCOLN COUNTY, NEVADA. Byron J. Sharp and Bert L. Myerson. Jan. 1956. 18p. $0.20(OTS).

Uranium was discovered on the Blue Bird claims in the Atlanta area, Lincoln County, Nevada, in 1954. This deposit is situated approximately 35 air miles north of Pioche, Nevada. The geology of the area consists of moderately folded and highly block-faulted sedimentary rocks of Ordovician age. These sediments are overlain by Tertiary volcanic rocks which have been disturbed by some of the faulting. Intrusive breccia pipes in the Ely Springs dolomite, the youngest of the Ordovician sedimentary rocks, have been silicified and mineralized and apparently controlled the localization of the gold, silver, and uranium minerals. The Blue Bird workings are in a silicified breccia pipe which contains quartzite fragments and silicified fragments of limestone and dolomite. Uraninite has been identified by x-ray methods in the silicified matrix of the rock. Three diamond drill holes on the property provided geologic information. Anomalous radioactivity was detected at a number of similar silicified breccia zones, including the Atlanta mine and several abandoned gold and silver workings in the Atlanta region. Surface and airborne prospecting of the Ely Springs dolomite is recommended in this region, especially near silicified breccia pipes. (auth)

4864 RME-3126

Bureau of Mines and Geological Survey.

MONAZITE PLACERS OF THE BROAD RIVER AND THICKETTY CREEK, CHEROKEE COUNTY, SOUTH CAROLINA. Leland A. Hansen and Paul K. Theobald, Jr. May 1955. 30p. $0.35(OTS).

The Broad River rises in the Blue Ridge in eastern Buncombe County, North Carolina and flows southeastward into Cherokee County, South Carolina. Buffalo Creek rises in western Lincoln County and northeastern Cleveland County, North Carolina. It flows southward into Cherokee County, South Carolina, where it joins the Broad River. The area drilled at the confluence of Buffalo Creek with

the Broad River is in the Piedmont Province 35 miles downstream from the headwaters of Buffalo Creek and 55 miles downstream from the headwaters of the Broad River. Thicketty Creek and Little Thicketty Creek rise in western Cherokee County, South Carolina and flow east and south to their junction southwest of Gaffney. The area drilled at the junction of these two streams is in the Piedmont Province 13 miles from the headwaters of Thicketty Creek and 9 miles from the headwaters of Little Thicketty Creek. Small monazite placers have been mined on tributaries to the four streams, but the flood plains drilled have never been mined for monazite. The Broad River placer area contains approximately 19.7 million cubic yards of minable alluvium with about 11.8 lbs. (0.44%) of concentrates and about 0.36 lb. (0.013%) of monazite per cubic yard. Total monazite reserves are estimated at 3,500 tons. The Thicketty Creek placer area contains approximately 20.8 million cubic yards of minable alluvium with about 14.5 lbs. (0.54%) of concentrates and about 0.41 lb. (0.015%) of monazite per cubic yard. Total monazite reserves are estimated at 4,300 tons. (auth)

4865 RME-3129

Bureau of Mines.

BOISE BASIN MONAZITE PLACERS, BOISE COUNTY, IDAHO. M. H. Kline, E. J. Carlson, and R. H. Griffith. Aug. 1950. 37p. $0.30(OTS).

The exploration of the Boise Basin monazite-bearing placers, which consisted of churn drilling, shafting, and trenching, was started on August 23, 1949 and completed on November 10. Thirty-seven churn-drill holes were drilled; 17 trenches excavated; and 12 shafts were sunk during this exploration work for monazite. A total of 404 samples was taken which consisted of 291 from churn-drill holes, 62 from trenches, 34 from shafts, 14 from old cuts and shafts, and 3 from dredging. The most extensive reserves of monazite-bearing gravels were found to be tailings from early operations for gold on Moores Creek, Grimes Creek, Granite Creek, and Elk Creek. The virgin ground reserves of monazite-bearing gravel were found to be located in the areas of Wolf Creek, Grassy Flats, Moores Creek, and Fall Creek. Since radioactive and chemical analyses fail to distinguish between monazite and other radioactive minerals which might be present, petrographic determinations were also made of each sample. A highly radioactive mineral believed to be samarskite was noted to occur in large amounts in the placer concentrates from Elk Creek and its tributaries. Other heavy minerals found in the black-sand concentrates were ilmenite, magnetite, garnet, zircon, and gold. (auth)

4866 RME-3134

Bureau of Mines.

PEARSOL CREEK MONAZITE PLACER AREA, VALLEY COUNTY, IDAHO. M. H. Kline and E. J. Carlson. Feb. 1954. 23p. $0.25(OTS).

The southeast end of the Pearsol area was found to contain comparable quantities of monazite and other heavy minerals. The type of material, with an almost complete absence of even finer-size gravel, would make the deposit readily minable with dredges. Recovery of the black sands on dredges and the subsequent separation of the monazite and other individual minerals present few problems to an experienced operator. In addition to monazite the black-sand concentrates contain magnetite, ilmenite, garnet, zircon, and other minerals. Of these, the ilmenite has the largest indicated tonnage and potential value. (auth)

4867

THE USE OF MONAZITES FOR AGE DETERMINATION. G. R. Tilton and L. O. Nicolaysen (Carnegie Insititution of Washington, D. C.). Geochim. et Cosmochim. Acta 11, 28-40(1957) Jan.–Feb.

The results of four new isotopically controlled age determinations on monazites are presented. Two of the samples exhibit gross discrepancies in their individual isotopic ages. Some acid-washing experiments have been made on the powdered samples which give correlations with the age patterns. Specifically, high U^{238}/Pb^{208} ages are accompanied by excessive solubilities of uranium relative to thorium and Pb^{206} relative to Pb^{208} in the acid washes. The problem of the cause of the discordant ages is discussed with the aid of these data. (auth)

4868

SOLID DIFFUSION IN RADIOACTIVE MINERALS AND THE MEASUREMENT OF ABSOLUTE AGE. L. O. Nicolaysen (Bernard Price Inst. of Geophysical Research, Univ. of the Witwatersrand, and National Physical Lab., C.S.I.R., Pretoria). Geochim. et Cosmochim. Acta 11, 41-59(1957) Jan.–Feb.

Diffusion of the daughter products of radioactive decay schemes from a mineral will be manifested in a pattern of discrepant age measurements. The theory of daughter product diffusion is examined in detail, and developed in graphical form. U, Th-bearing minerals frequently exhibit the discrepant pattern Pb^{207}/Pb^{206} age > Pb^{207}/U^{238} age > Pb^{206}/U^{238} age, which may be explained by diffusion; with this assumption, use of the graphs given in this paper will indicate the true age of the mineral and the diffusion coefficient which governed the loss of Pb. Examples of such graphical application of diffusion theory are given for several zircon concentrates and monazite samples, and values of the Pb diffusion coefficient between 10^{-21} cm^2/sec are obtained. The effects of isotopic mass, daughter product concentration, radiation damage, and temperature are discussed; it is concluded that daughter product diffusion deserves consideration as a possible cause of discrepant age measurements, obtained from the use of several decay schemes. This theory of daughter isotope diffusion can be tested quantitatively by performing age determinations on several mineral samples (possessing a large variation in grain size) from a particular locality. (auth)

4869

GEOCHEMISTRY OF URANIUM IN THE BALTIC SEA BASIN. Fritz F. Koczy, Ernst Tomic, and Friedrich Hecht. Geochim. et Cosmochim. Acta 11, 86-102(1957) Jan.–Feb. (In German)

In order to study the geochemistry of U on typical shelf zones, samples of river water and sea water, as well as samples of sediment from the Baltic Sea region, have been examined. The Baltic Sea region was chosen for the investigation since its hydrography is well known, water transport to and from it can be estimated to a high degree of accuracy, and the region can be well sampled. The U content of river water originating in regions of igneous rocks is low, averaging 0.5×10^{-6} g U/l. The U content of rivers from sedimentary rock regions seems higher by a factor of two or more, the maximum value found being 12.8×10^{-6} g U/l. It may be concluded that the U is more easily leached out from sedimentary regions. While the southern and eastern rivers supplying water to the Baltic Sea have not been investigated, it can be assumed that their U content is high, especially since the sea area surrounding the mouths of these rivers exhibit high U values. The Ra content of river water is not in equilibrium with the U, amounting to only 10% of the latter. It is thus concluded that U is more soluble than Ra. The U content of water from the Baltic Sea is also variable ranging from 0.77 to 5.9×10^{-6} g U/l. High salinity inflowing water shows 1.8×10^{-6} g U/l., while that of outflowing water is less, averaging 0.9×10^{-6} g U/l. Except for the southeastern regions and deep water areas, a marked correlation of salinity and U content exists. An increase of deep water U content correlates with a surface water in-

crease. Surface water increases can be explained by the high U content of inflowing river waters; high deep water values are correlated with an O deficiency. Here it may be assumed that the U (VI) is reduced to U (IV) forming insoluble complex compounds with organic material. This settles slowly to the bottom, and explains the rather high U content of the sediment (values range between 3.2 and 10.3×10^{-6} g U/g; the normal content in clays is about 2×10^{-6} g U/g). By an intense study of the distribution of U in sediments, completed by age determination by aid of C^{14}, it may be possible to follow the changes in the past of the state of ventilation of the deep basins of the Baltic Sea. The attempt to work out a U balance sheet for Baltic Sea U demonstrates precipitation about equals that which is brought in by rivers. Influx totals 1100 to 1400 metric tons per year, efflux 700 to 1000, leaving about 100 to 700 tons of precipitated material. The investigation carried out shows that a considerable quantity of U is precipitated on the Baltic Sea shelf. It appears to be caused by biological activity in the sea which in turn causes an O deficiency. The process is slow. Rivers with a high U content can raise the U content of the sea water if they empty under conditions wherein the above factors are not fulfilled. On the other hand, in estuaries and bays into which U bearing rivers do not flow, U can be precipitated from sea water by a high biological activity, which is connected with O deficiency. When the minerogenous sedimentation is at the same time very small, the U content of the sediment is enriched, amounting to 200×10^{-6} g U/g and more. (auth)

4870

MEASUREMENT OF Th ISOTOPES IN SEA WATER. F. F. Koczy, E. Picciotto, G. Poulaert, and S. Wilgain. Geochim. et Cosmochim, Acta 11, 103-29(1957) Jan.–Feb. (In French)

In order to study the geochemistry of thorium isotopes in the hydrosphere, particularly in the ocean, a method has been worked out by which Th^{232}, Th^{230}, Th^{228}, and Th^{227} can be determined separately. Eight samples of 20 to 40 liters of sea-water, from 23.0‰ to 34.97‰ salinity, were collected in November 1953, in the Skagerak and the Gullmarfjord (Sweden). Thorium was isolated by the following procedure: just after collection, the samples were brought to pH 2 and a given amount of Th^{234} (UX_1) was added as tracer. Thorium was first precipitated with $Fe(OH)_3$ as carrier. Further purification was obtained by ion-exchange column chromatography followed by solvent extraction; the final fraction was obtained as the citric complex, a form suitable to incorporation in the photographic emulsion. The total yield varied from 8 to 23% according to the sample, as determined by the β activity of the tracer. The various Th isotopes were measured through their α activity, using nucelar photographic emulsions, more precisely the double-emulsion technique. RdTh and RdAc both generate five-branched stars; more than 90% of these originated from RdTh, as indicated by the length of the tracks: while Io and Th only yield single tracks of range 18.8 μ and 15 μ respectively in the emulsion. Most samples showed a much lower activity than expected; this did not make it possible to discriminate between Io and Th through the range distribution of their tracks, thus we could only ascertain upper limits of Io and Th concentrations. (auth)

4871

GEOLOGY OF THE ATOMIC ENERGY COMMISSION NEVADA PROVING GROUNDS AREA, NEVADA. Mike S. Johnson and Donald E. Hibbard. U. S. Geol. Survey Bull. 1021-K. 1957. 55p and 2 illus.

The Nevada proving grounds area in Nye and Clark Counties, Nev., is about 700 square miles in size and lies about 70 miles northwest of Las Vegas in southern Nevada. It consists essentially of two large valleys, Yucca and Frenchman Flats, both surrounded and separated from one another by hills and mountains of variable relief. Seventeen Paleozoic formations and one of Tertiary age have been recognized in the Nevada proving grounds area. The Paleozoic formations are Early Cambrian to probable early Permian in age and consist of 22,000 feet of limestone, dolomite, quartzite, shale, and conglomerate beds. The predominantly volcanic Oak Springs formation of Tertiary age is at least 2,000 feet thick and is the most widespread formation in the area. A granitic intrusion of probable Late Cretaceous to early Tertiary age has metamorphosed and mineralized some of the Paleozoic rocks, and dikes of middle Tertiary or later age occupy normal faults along the northeastern margin of the area. Quaternary deposits reaching a maximum thickness of more than 800 feet are mostly a heterogeneous mixture of detritus derived from bedrock areas. This fill contains some caliche and fanglomerates. Playas made up wholly of impermeable fine silt and clay are present. During the Mesozoic era uplift and attendant folding and contemporaneous thrust faulting occurred, probably in Cretaceous time. Normal faulting began in early Tertiary time, followed by volcanic deposition and later by continued normal fault displacement. (auth)

METALS AND METALLURGY

4872 BM-RI-5311

Bureau of Mines.

CONSUMABLE-ELECTRODE ARC MELTING OF TITANIUM AND ITS ALLOYS. R. W. Huber and I. R. Lane, Jr. June 1955. 39p.

A consumable-electrode arc-melting furnace was constructed for the production of uncontaminated Ti and Ti-alloy ingots. The furnace was designed to allow for evacuating to very low pressures and back filling with He and A mixtures for melting at or near atmospheric pressure. Vacuum melting at a few millimeters pressure was also used with a mixture of He and A gas sweeping the crucible. For research purposes a 25- to 30-lb ingot, 4 in. in diameter by 15 in. in length, was selected to provide enough ½-in. plate for extensive tensile and impact testing of standard size specimens. The homogeneity of several alloy ingots was determined, and excellent results were obtained. By using a large electrode-to-ingot-area ratio and high currents or power inputs to the arc furnace rather uniform ingots were routinely prepared. (auth)

4873 BM-RI-5315

Bureau of Mines.

ELECTROREFINING TITANIUM METAL. J. R. Nettle, D. H. Baker, Jr., and F. S. Wartman. July 1956. 46p.

A method was developed for successfully electrorefining Ti metal. Refining is accomplished in a fused-salt electrolyte using offgrade metal as the anode and collecting the purified metal at the cathode. The characteristics and requirements of the various alkali chlorides tested as electrolytes are discussed in relation to relative ease of purification and serviceability. The various types of cells designed and tested for electrorefining are illustrated and their method of operation discussed. The individual advantage of each cell and the purpose for which it was designed are reviewed. The magnitude of the cathode current density was found to depend largely upon the quantity of soluble titanium chloride in the electrolyte. The physical condition of the anode also greatly affected the cathode current density. The Ti was refined from offgrade sponge and scrap, which contained O_2, N_2, and Fe as impurities. These contaminants remained in the anode sludge. Comparative analyses of the offgrade vacuum-distilled Kroll

sponge used and a 10-pound leached composite of the plus-28-mesh fraction of electrorefined Ti produced from it are given. Titanium was also refined from certain elements found in commercial alloys, but only a few of these have been tested. The success in eliminating Mo and Cr and the unsuccessful attempts with Mn are reported. (auth)

4874 BMI-1143
Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF SOME NIOBIUM-BASE ALLOYS. Stan J. Paprocki and John T. Stacy. Oct. 31, 1956. 18p. Contract W-7405-eng-92. $0.20(OTS).

Twenty-seven Nb-base alloys, containing 5 wt. % of Al, Cr, Fe, Mo, Ni, Ta, W, V, or Zr, and with an addition of 0, 9.5, or 19.0 wt. % Ti, were examined for workability, ductility, hardness at room temperature and 1600°F, and oxidation resistance at 1800°F. Addition of Ti generally improved workability, increased hot hardness, and promoted oxidation resistance. Some exceptions to this pattern were noted: the hardest alloy at 1600°F, Nb wt. % Zr, softened with added Ti, and the oxidation resistance Nb wt. % Mo and the Nb wt. % V alloys was not increased by additions of Ti. (auth)

4875 BMI-1154
Battelle Memorial Inst., Columbus, Ohio.
STUDIES RELATING TO THE REACTION BETWEEN ZIRCONIUM AND WATER AT HIGH TEMPERATURES. Alexis W. Lemmon, Jr. Jan. 3, 1957. 123p. Contract W-7405-eng-92. $0.65(OTS).

Experimental studies are made of the rate of reaction between solid and molten Zircaloy and steam, spectral and total emissivity of Zircaloy and its oxide, and the rate of diffusion of O_2 in Zircaloy. Theoretical and experimental studies are reported on the amount of reaction expected for a drop of molten Zircaloy falling through H_2O. (auth)

4876 CF-57-1-109
Oak Ridge National Lab., Tenn.
METALLURGICAL EXAMINATION OF HRT LEAK DETECTOR TUBING AND FLANGES. G. M. Adamson, J. P. Hammond, T. M. Kegley, and J. K. White. Jan. 31, 1957. 25p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

4877 CF-57-2-51
Oak Ridge National Lab., Tenn.
THERMAL CONDUCTIVITY OF BERYLLIUM: LITERATURE SURVEY. W. D. Powers. Feb. 12, 1957. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

4878 IGRL-IB/R-17
Gt. Brit. Dept. of Atomic Energy. Industrial Group H. Q., Risley, Lancs, England.
HYDROGEN SOLUBILITY IN METALS. Information Bibliography. B. Yates. Nov. 1956. 34p.

A wide selection of the report and journal references to the solubility of H in metals, with particular reference to non-ferrous metals, excluding, except where coincidental, features such as embrittlement. A selection of references to the solubility of H in C and ceramic materials is also included. Sources searched were U.K. and U.S. classified and unclassified reports abstracts, Nuclear Science Abstracts, Engineering Index (1946–1955), Industrial Arts Index (1956–), Metallurgical Abstracts (1946–), Chemical Abstracts (1946–), Fuel Abstracts (1946–), British Non-Ferrous Metals Research Association Bulletin (1951–), and the index to the 'Information Bulletin.' (auth)

4879 ISC-812
Ames Lab., Ames, Iowa.
TABULATION, BIBLIOGRAPHY, AND STRUCTURE OF BINARY INTERMETALLIC COMPOUNDS. II. COMPOUNDS OF BERYLLIUM, MAGNESIUM, AND CALCIUM. K. A. Gschneidner, D. J. Beerntsen, R. W. Vest, J. A. Kingston, and J. F. Smith. Dec. 27, 1956. 36p. Contract W-7405-eng-82. $0.30(OTS).
(See also ISC-795.)

4880 KLX-10056
Vitro Labs., West Orange, N. J.
ELECTROKINETIC PROCESSES—NUCLEAR ASPECTS. Quarterly Progress Report [for] August 1, 1956–October 31, 1956. Vitro Job 2018. H. F. Reichard, A. C. Werner, H. G. Scheible, and G. V. Delaney. Nov. 15, 1956. Decl. Mar. 4, 1957. 9p. Contract AT(30-1)-850. $1.80(ph OTS); $1.80(mf OTS).

Composite CeO_2–Fe coatings were prepared for possible neutron absorption studies; coatings containing 75% Fe appeared most promising. Cadmium coatings were prepared from dispersions of CdO, Cd metal, and ball-milled Cd metal. Coatings from ball-milled Cd metal were best; however, they were only partially sintered and, apparently, CdO formed on the surface. Carburization studies on electrophoretically-prepared W coatings gave inconclusive results. (For preceding period see KLX-10041.) (auth)

4881 MAB-115-M
National Research Council. Materials Advisory Board.
ALLOYS FOR USE AT ELEVATED TEMPERATURES. Feb. 25, 1957. 123p. Contract DA-49-025-sc-83.

4882 NACA-1243
Michigan. Univ., Ann Arbor. Engineering Research Inst.
HIGH-RESOLUTION AUTORADIOGRAPHY. George C. Towe, Henry J. Gomberg, and J. W. Freeman. June 1, 1953. 55p.

This report supersedes NACA-TN-3209.

This investigation was made to adapt wet-process autoradiography to metallurgical samples to obtain high resolution of segregated radioactive elements in microstructures. Results are confined to development of the technique, which was perfected to a resolution of less than 10 microns. The radioactive samples included C^{14} carburized iron and steel, Ni^{63} electroplated samples, a powder product containing Ni^{63}, and W^{185} in N-155 alloy. (auth)

4883 NRL-4861
Naval Research Lab., Washington, D. C.
FURTHER STUDIES ON STAINLESS-STEEL HOT CRACKING. P. P. Puzak and H. Rischall. Oct. 22, 1956. 12p. Project NR-512-000.

Previous studies of several Types 347 and 304 stainless steels suggested that the development of weld-metal and base-metal hot cracking involved the grain-boundary liquation of fusible segregates. Additional studies were made on these materials, with special attention directed towards comparing test results for a Type 347 heat (which was established previously to be most susceptible to hot cracking) with those for a standard Type 304 heat (which was not susceptible). Liquidus and solidus temperatures for all materials were obtained by thermal-analysis techniques. The hot ductility and strength measured in the temperature range immediately below the region of normal incipient melting were low only for those heats which exhibited base-metal hot cracking. Microscopic examination of these specimens revealed the presence of grain-boundary liquation areas. Thus, the test data provide further evidence supporting the hypothesis that grain-boundary liquation is responsible for base-metal hot cracking of stainless steels. The results of chemical analysis and x-ray-diffraction studies suggest that a eutectic-type mixture of CbC and CbN with minor amounts of Mn, Si, and Fe is the probable segregate composition involved in the liquation cracking of the Type 347 alloys. (auth)

4884 NRL-Memo-438
Naval Research Lab., Washington, D. C.
MECHANICAL PROPERTIES OF CARBON STEEL THIMBLE INTENDED FOR PRESSURE VESSEL SERVICE AT 600–650°F. R. H. Raring and Paul Shahinian. Mar. 1955. 11p.

Material from a steel thimble was examined for suitability for prolonged service at 600 to 650°F while subjected to a maximum stress of approximately 23,000 psi. The material showed increased tensile strength and decreased yield strength at 600 to 700°F compared to room temperature properties. At 600°F, the material has a 1000-hr rupture strength of 72,000 psi. The total strain that the material may be expected to undergo in 10,000 hours at 700°F, 30,000 psi, is estimated as 0.0215. (auth)

4885 OSR-TR-57-12
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
A STUDY OF A FAMILY OF LAVES-TYPE INTERMEDIATE PHASES. Final Technical Report [for] March 15, 1955 to May 13, 1956. Rodney P. Elliott. Jan. 18, 1957. 24p. Project B 079. Contract AF18(600)-1399. (AD-120421).

Paramagnetic susceptibility measurements were made on binary and ternary Laves-type phases of constant atomic proportions of Ti and Zr. Comparison of the susceptibilities of the binary compounds with the susceptibilities of the component elements indicates that the free electrons of the components are contributed directly to the compound lattice. Measurements of the ternary alloy susceptibilities indicate a nonlinear function with composition. This is indicative of a complex density of states vs energy curve precluding direct calculation of the component valencies. Paramagnetic trends of binary and ternary Laves compounds offer further proof that the free electron valency of the elements of the first transition series decreases as atomic number increases. (See also OSR-TR-56-22.) (auth)

4886 SEP-208
Sylvania Electric Products Inc. Atomic Energy Div., Bayside, N. Y.
AN INVESTIGATION OF THE SLIP-CASTING MECHANISM AS APPLIED TO STAINLESS STEEL POWDER. W. G. Lidman and R. V. Rubino. Feb. 23, 1956. 23p. Project No. 1834. Contract AT-30-1-GEN-366. $0.25 (OTS).

The slip-casting technique, which is successfully employed in the ceramic industry, was utilized to produce sintered stainless steel components experimentally. The procedure used is described, along with an evaluation of the physical and mechanical properties of the samples produced. Specimens were made with properties comparable to those of wrought stainless steel and of cold pressed and sintered steel powder. (auth)

4887 SEP-209
Sylvania Electric Products Inc. Atomic Energy Div., Bayside, N. Y.
CONSUMABLE ELECTRODE ARC-MELTING OF COLD-COMPACTED THORIUM POWDER. R. Witt. Apr. 19, 1956. Decl. July 19, 1956. Contract AT-30-1-GEN-366. $0.25(OTS).

The consumable electrode arc melting of cold-compacted Th powder has been developed to produce dense, clean, and soft ingots which can be hot rolled without cracking. By using a water-cooled Cu crucible, contamination has been prevented and resultant ingots cleaner than the original powder have been produced. The relationship of specific variables such as power at the arc, crucible size, electrode size, and A pressure have been determined relative to minimum requirements to obtain sound ingots. The data have been found to be applicable to other metals when reasonable corrections are applied. (auth)

4888 WADC-TR-56-374(Pt. 1)
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
MECHANICAL PROPERTIES OF UNALLOYED CHROMIUM. Period covered: April 1, 1955 to March 30, 1956. Sheldon A. Spachner and William Rostoker. Dec. 1956. 73p. Project title: METALLIC MATERIALS. Task title: CORROSION AND HEAT RESISTANT ALLOYS. Contract AF33(616)-2978. (AD-118014).

Melting, press forging, and machining techniques were developed which permitted production of 3 in. × $\frac{1}{4}$ in. chromium test specimens from ten pound heats of commercially available laboratory grade electrolytic Cr. The dependencies of the shear strength, ultimate shear strain, yield stress in shear, and strain hardening exponent upon temperature and strain rate were evaluated over a temperature range of 1000°C and a strain rate range of 100:1 by means of a specially constructed torsion machine. The mechanical performance of laboratory grade material at 750°C was compared with that of lots of material which possessed more N or less O than the laboratory grade, permitting an evaluation of the relative effect of these impurities at this temperature. The ductile-brittle transition temperature of the forged laboratory grade material was determined and found to be at 49°C. A study of the effect of prestrain temperature upon the ductile-brittle transition point determined the functionality for prestrain temperatures of 250, 400, and 550°C. At temperatures of 250 and 400°C the transition point was depressed below room temperature for varying amounts of prestrain, allowing a measurement of room temperature ductility. A maximum shear strain of 0.11 in./in., or 79.5° of twist, was recorded for a specimen which was prestrained 0.75 in./in. at 250°C. The general problem of correlating plastic flow curves obtained in tension with those obtained in torsion was explored in an effort to determine what relation the mechanical property information obtained in torsion might have to that of tension. The theory of plastic flow was redeveloped, taking into account the true value of Poisson's ratio of the test material and relations necessary for equilibration of strain rates in tension and torsion. Brass specimens were subjected to both constant crosshead velocity tension tests and equivalent strain rate torsion tests. Results showed that the strain hardening exponent in torsion was not dependent upon strain rate in torsion, but was dependent upon strain rate in tension. The testing method developed furnishes a method of comparing flow properties of metals in torsion with flow properties of those in tension. (auth)

4889 WAPD-163
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE MELTING AND FABRICATION OF FUEL ELEMENTS FOR A PHYSICS CRITICAL EXPERIMENT. B. F. Rubin, F. L. Shubert, and W. B. Haynes. Oct. 1956. Decl. Feb. 28, 1957. 19p. Contract AT-11-1-GEN-14. $3.30 (ph OTS); $2.40(mf OTS).

Unclad fuel elements for a critical experiment were fabricated successfully from vacuum induction melted ingots of U–10 wt. % Nb. Fabrication was accomplished by breaking down the ingot by extrusion or forging then hot rolling the bars to a size for finish machining. Finished fuel plates were given 100% inspection for bow, camber, length, width, thickness, surface appearance, and chemical composition. A summary of the equipment and techniques utilized is presented. (auth)

4890 WAPD-TM-42

Westinghouse Electric Corp. Bettis Plant, Pittsburgh. THERMAL DIFFUSION OF HYDROGEN IN ZIRCONIUM. Preliminary Report. J. M. Markowitz and J. Belle. Feb. 1957. 21p. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70(mf OTS).

To explain the unusual corrosion failures of the Zircaloy-2 cladding in the X-1-h and X-1-g irradiation specimens, a mechanism was proposed which requires that H is introduced into the Zircaloy cladding at the internal surface. Ordinarily, the H should remain in the neighborhood of the interior surface. However, metallographic examination of the cladding showed that the highest concentration of H was actually near the exterior surface; in some instances, concentrations at this surface were large enough to produce hydride precipitation. Since the temperatures of the interior and exterior surfaces of the cladding were considerably different, it was proposed as part of the over-all mechanism that H is transported through the Zircaloy-2 from the interior to the exterior surface of the cladding by the process of thermal diffusion. This report is both a summary of preliminary studies on this problem and a proposal to extend the investigation. (auth)

4891

TITANIUM COATING AND ITS APPLICATION. I. TITANIUM CEMENTATION. Takashi Yamaguchi, Kazuo Hirayama, and Takeshi Takei. J. Sci. Research Inst. (Tokyo) 50, 247-52 (1956) Dec.

It is shown that iron and steel in contact with Ti powder in reduced atmosphere at 950 to 1200°C, become coated with a Ti rich layer by diffusion and that highly corrosion-resistant materials can be obtained by this treatment. The apparent energy of activation of the diffusion process is estimated. It has a value of 58 to 62 kcal. (auth)

4892

INVESTIGATION OF THE ANNEALING OF DEFORMED NICKEL POWDER BY X-RAY AND STORED ENERGY MEASUREMENTS. D. Michell and F. D. Haig (Univ. of Melbourne, Australia). Phil Mag. (8) 2, 15-32(1957) Jan.

The stored energy was measured by a calorimetric method. The measured value of 3.6 cal/g and the manner of its release suggests that a wide range of deformations is present, both the maximum and average deformations being considerably greater than those present in heavily deformed solid specimens of nickel. The diffraction patterns, measured with a Geiger counter spectrometer, show that during annealing there is no change in the background intensity. The integrated intensities of the high angle lines remain constant and small changes in the low angle lines are attributed to changes in extinction. Only small changes occur in the tails of the lines at temperatures of annealing up to 400°C. No evidence has been found for stacking faults or changes in lattice parameter. The diffraction profiles are analyzed by a number of methods, the broadening in each case being attributed partly to strain and partly to small particle size. The results indicate two stages in the relief of strain. The first occurs mainly in the less severely deformed regions without increase in the 'apparent particle size' and is attributed to recovery. In the second, all the remaining strain is relieved by recrystallization with an increase in the 'apparent particle size.' For the deformed powder the 'apparent particle size' is in the range 350 to 2300 A and the energies derived from the analyses range from 0.02 to 1.5 cal/g. The discrepancy between the calculated values of energy and the value obtained experimentally is discussed in terms of the distribution of strain within the crystal. (auth)

4893

THE THERMAL CONDUCTANCE OF CONTACTS BETWEEN ALUMINIUM AND OTHER METALS. F. Boeschoten and E. F. M. Van der Held. Physica 23, 37-44(1957) Jan.

The coefficient of heat transfer of a joint between aluminum and aluminum, steel and uranium respectively was measured. The gap between the metal surfaces was filled with air, helium or hydrogen of gas pressures varying between 1 mm Hg and 750 mm Hg. Some oils also were introduced in the joint. The temperature of the joint was in all experiments about 150°C. It appears that at low contact pressures of several kgf cm^{-2} the heat conduction takes place principally through the gas in the gap, whereas at higher contact pressures the metallic contact spots contribute more and more to the conductance. This is in agreement with the measurements of Weills and Ryder. Calculation of the thickness of the gap from heat conductance measurements are in rough agreement with roughness measurements with a profilometer and a microscope. An estimation is made of size and the number of the metallic contact spots, using the theory for electric contacts of Holm and others. From thermal conductance and hardness measurements the average radius of the contact spots is found to be about 30 μ, whereas about 100 of such spots may be found per square centimeter at a contact pressure of 35 kgf cm^{-2}. The contact pressure has not much influence on the size of the contact spots, but their number varies proportionally with the contact pressure. Above a certain value of the contact pressure a confluence of the contact spots takes place and a decrease of their number. Moreover it seems that the size of the contact spots is independent of the metals by which the joint is formed, a value of about 30 μ being found for a great variety of metals, such as aluminum, uranium, steel, copper, nickel and graphite, under different circumstances, regarding the applied contact pressure and the size and the shape of the joints. This independence of the size of the contact spots of the contact pressure and the materials of the joint, makes it possible to estimate the coefficient of heat transfer of arbitrary metallic joints. (auth)

4894

INERT-GAS TUNGSTEN-ARC BUTT WELDING OF ZIRCALOY-2 TUBES. J. W. Lingafelter (Hanford Atomic Products Operation, Richland, Wash.). Welding J. (N. Y.) 36, 230-5(1957) March.

A 52-ft length of internally ribbed Zircaloy-2 tube was produced by inert-gas tungsten-arc welding together three shorter length pieces. Radiographic inspection of the welds showed that the welded joints were fully penetrated and contained no significant porosity, voids or contaminants. Mechanical, metallurgical and corrosion testing of duplicate test samples indicated that strong, ductile and corrosion-resistant welds can be produced by the procedure described. In addition, the ease with which tubes may be joined by inert-gas tungsten-arc welding has been demonstrated. (auth)

4895

JOINT DESIGN FOR MAKING ROOT-PASS WELDS WITHOUT FILLER METAL. L. C. Lemon (Hanford Atomic Products Operation, Richland, Wash.) and W. R. Smith (General Electric Co., San Jose, Calif.). Welding J. (N. Y.) 36, 240-2(1957) March.

A joint was designed and a technique developed for making root-pass welds by the inert-gas tungsten-arc process without the addition of filler metal. The method produces a uniform full penetration weld reinforcement on the far side of the joint in all positions of welding. A detailed description of the joint design and welding technique employed is given. Schematic drawings and photographs are employed to demonstrate the joint design. (auth)

4896

PERIPHERAL WELDING OF INTERNALLY-CLAD STEEL FOR NUCLEAR REACTOR APPLICATION. W. Leonard (Oak Ridge National Lab., Tenn.) and J. C. Thompson, Jr. (Union Carbide Nuclear Co., Y-12 Plant, Oak Ridge, Tenn.). Welding J. (N. Y.) 36, 243-51(1957) March.

Methods for welding stainless clad carbon steel from the unclad side are reviewed and discussed. The use of an ingot-iron insert to prevent notching is recommended. The preferred method of making the transition from stainless steel weld metal to carbon steel weld metal is given. (T.R.H.)

4897

A COMPARATIVE STUDY OF THORIATED, ZIRCONIATED AND PURE TUNGSTEN ELECTRODES. L. P. Winsor (Rensselaer Polytechnic Inst., Troy, N. Y.) and R. R. Turk (North American Aviation, Downey, Calif.). Welding J. (N. Y.) 36, 113s-19s(1957) March.

Thoriated-tungsten electrodes showed superior starting performance during d-c straight polarity welding of stainless steel, followed by zirconiated tungsten and pure tungsten in that order. Electrode consumption resulting from normal starting and evaporation was found to be negligible compared with loss caused by erosion from contamination introduced by the weld metal. Metallographic studies of the electrodes indicate that erratic arcing and the rate of erosion are both functions of the type of recrystallized structure existing in the electrode tip during welding. The formation of a ball of molten W at the electrode tip during a-c welding of Al eliminated contamination of the electrode by the base metal. (auth)

4898

NUCLEAR METALLURGY (VOL. III). A SYMPOSIUM ON THE EFFECTS OF RADIATION ON METALS, HELD OCTOBER 8, 1956, AT CLEVELAND. George H. Vineyard, Donald E. Thomas and Douglas S. Billington. New York, AIME, 1956. 55p. $3.75.

Refer also to abstract 5010.

PHYSICS

4899 UCRL-4732

California. Univ., Livermore. Radiation Lab.

PRELIMINARY STUDY OF REGENERATIVE LIGHT AMPLIFICATION. Ralph Kalibjian. Aug. 7, 1956. 25p. Contract W-7405-eng-48. $0.25(OTS).

A preliminary study is presented of regenerative light amplification in which the image intensification is achieved purely by optical regeneration. By optical regeneration is meant the process in which the image output at the phosphor of an image intensifier is fed back in perfect registry to the photocathode of the image intensifier. It is found that a light gain (watts output/watts input) of one million may be obtained within 5 to 17 feedback trips, depending upon the loop gain of the system from 10 to 2, with a resolution of about 8 to 1 lines per mm. The light gain may be considerably higher than one million depending upon the saturation of the phosphor. The regenerative image intensifier employs a pulsed system, which may be used in observing nuclear particle tracks in scintillators. (auth)

4900 WAPD-ADC-22

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

EXPERIMENTAL PROGRAM USING VAN DE GRAAFF FACILITIES. Walter W. Godsin, George P. Simon, Yale Solomon, and Leon Weber. [Sept. 1956]. 17p. $3.30(ph OTS); $2.40(mf OTS).

A Van de Graaff facility was obtained in order to further studies on deposition of corrosion products on reactor fuel elements. The facility consists of a Van de Graaff electron generator and a stainless steel loop capable of operating at reactor temperatures and pressures. Pertinent loop data are summarized. The proposed program of studies is outlined. (B.J.H.)

4901

PARTICLE-SIZE EFFECTS IN EXPLOSIVES AT FINITE AND INFINITE DIAMETERS. M. E. Malin, A. W. Campbell, and C. W. Mautz (Los Alamos Scientific Lab., N. Mex.). J. Appl. Phys. 28, 63-9(1957) Jan.

The effect of particle-size variations on the detonation velocity of the two-component solid explosive, Composition B, has been studied at various diameters and shown to be important. An attempt has been made to apply the diameter-effect theory of Eyring and that of Jones to explain the experimental data, but without complete success. The presence of large crystals in low-density RDX has been shown to lead to a "super velocity" which still prevails at infinite diameter. Experiments using large spheres of Composition B have been performed which also demonstrate a "super velocity" which may be related to the effect found in RDX. (auth)

4902

ON THE EXISTENCE OF STEADY-STATE DETONATIONS SUPPORTED BY A SINGLE CHEMICAL REACTION. W. W. Wood (Los Alamos Scientific Lab., N. Mex.) and J. G. Kirkwood (Yale Univ., New Haven, Conn.). J. Chem. Phys. 25, 1276-7(1956) Dec.

4903

VOLUME CHANGE ON MELTING OF N_2 UP TO 3500 kg/cm^2. E. R. Grilly and R. L. Mills (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 105, 1140-5(1957) Feb. 15.

New and more accurate measurements were made of the volume change on melting of N_2 up to 3500 kg/cm^2. Liquid density and thermal expansion were also studied along the melting curve. A low-pressure metering system was used throughout. The ΔV_m data were fitted to the empirical equation, $\Delta V_m = A - B \log_{10}(P + C)$, with success. Combination of this equation with our previously reported melting equation yields expressions for ΔS and ΔH of melting useful up to 3500 kg/cm^2. (auth)

4904

THE OSMOTIC PRESSURE OF LIQUID ^{3}He–^{4}He MIXTURES AT TEMPERATURES BELOW THE LAMBDA-POINT. D. H. N. Wansink and K. W. Taconis. Physica 23, 125-39 (1957) Feb.

The osmotic pressure of liquid He^3–He^4 mixtures, condensed in a vessel connected by means of a narrow slit to a similar vessel containing pure He^4, has been measured by determining the fountain pressure exerted by the pure He^4, when heated, necessary to obtain equilibrium with the osmotic pressure of the mixture. The osmotic pressure meets Van 't Hoff's law within a few percent up to 4% concentration. A revised vapor pressure–liquid concentration relation is given, based on the results, obtained at 1.2°K. (auth)

4905

CALCULATION OF THERMODYNAMIC QUANTITIES OF ^{3}He–^{4}He MIXTURES FROM THE VAPOUR PRESSURE AT TEMPERATURES BETWEEN 1.2 and 1.9°K. D. H. N. Wansink. Physica 23, 140-53(1957) Feb.

On the basis of the vapor pressure of He^3–He^4 mixtures, partly measured directly by Sommers and by Wansink et al. and partly calculated from the osmotic pressure data obtained by Wansink and Taconis, the change of the Gibbs

function of the mixture with concentration has been calculated in the temperature region between 1.2 and 1.9°K at concentrations up to 7% He^3. The entropy, enthalpy and specific heat of mixing are given in comparison with experimental data. The phase separation at low temperatures and the mechanocaloric effect of He^3-He^4 mixtures are calculated. (auth)

4906

MERCURY VAPOR JET TARGET AND STRIPPER. Robert Beringer and Waldo Rall (Yale Univ., New Haven, Conn.). Rev. Sci. Instr. 28, 77-9(1957) Feb.

A supersonic mercury vapor jet has been developed for use in stripping electrons from a beam of heavy ions. The required surface densities (2 to 20 $\mu g/cm^2$) were obtained with the apparatus described. The increase in pressure caused by the jet was less than 3×10^{-7} mm Hg at the end of a 10-in. beam tube. (auth)

COSMIC RADIATION

4907

INTENSITY AND ENERGY SPECTRUM OF FAST NEUTRONS IN COSMIC RADIATION. Saburo Miyake, Kensaku Hinotani, and Kan-ichi Nunogaki (Oska City Univ.). J. Phys. Soc. Japan 12, 113-21(1957) Feb.

The intensity and the energy spectrum of low energy neutrons at Mt. Norikura (2740 m above sea level and 25° N geomagnetic latitude) were obtained by observing recoil protons with the randomly operated high-pressure cloud chamber filled with hydrogen gas at the pressure of 92 atm. The differential energy spectrum for neutrons in the energy range from 1 Mev to 15 Mev was found to be expressed by $(1.2 \pm 40\%) \times 10^{-6} \times E^{-1.25 \pm 0.10}$ cm^{-2} sec^{-1} $sterad^{-1}$ Mev^{-1}. The neutron flux is in conformity with what one would expect from the density of thermal neutrons. Connecting the present data with the others which were obtained by many investigations in different energy ranges, the energy spectrum of neutrons ranging from 1 ev to 10 Bev are discussed. (auth)

4908

OBSERVATION OF COSMIC-RAY NEUTRON INTENSITY AT GEOMAGNETIC LATITUDE 25°N. PART I. ATMOSPHERIC EFFECTS. Masahiro Kodama, Kazuaki Murakami, and Yataro Sekido (Nagoya Univ.). J. Phys. Soc. Japan 12, 122-5(1957) Feb.

The intensity of cosmic-ray neutrons has been continuously observed at sea level and mountain. The value of absorption mean free path of neutron in the atmosphere, deduced from the barometer effect observed at each station, is 139 ± 5 gr/cm^2, while 136 ± 2 gr/cm^2 was obtained from the intensity difference between two stations at different altitude. (auth)

4909

ON THE POSITIVE TEMPERATURE EFFECT IN THE COSMIC RADIATION AND THE $\pi-\mu$ DECAY. H. Trefall. Physica 23, 65-72(1957) Jan.

The temperature effect due to competition between disintegration of π mesons and absorption through nuclear interactions is discussed. It is shown that the magnitude of this effect as much depends on the probability for production of new π mesons in meson-initiated interactions as it depends on the interaction mean free path. An attenuation length of the π-meson component is defined to represent the loss of π mesons through nuclear interactions, and it is shown that this quantity and not the interaction mean free path itself determines the magnitude of the positive temperature effect at a given mean life of the π mesons. A simple but fairly accurate approximate formula for the temperature effect has been developed. A comparison with experimental results shows that the attenuation length of the π meson component is hardly less than twice the interaction mean free path. (auth)

4910

COSMIC RAY STARS IN NUCLEAR EMULSIONS AT THE EQUATOR AND AT HIGH ALTITUDE. B. Jongejans, F. Schurink, and D. J. Holthuizen. Physica 23, 164-8(1957) Feb.

Results are reported of a nuclear emulsion experiment performed at 4840 meters above sea-level and 0° latitude. For uncovered plates a star production of 10.1 ± 0.9 stars per cm^3 emulsion per day at a pressure of 560 g cm^{-2} is found, being a minimum as compared to data at other latitudes. Within the limits of error, no attenuation is observed for the total star number in 30 cm of lead. For high energy star producing radiation an attenuation length in lead of 550 g cm^{-2} with a lower limit of 310 g cm^{-2} resulted. The number of p stars varies approximately as the number of all stars with latitude. The importance of several checks when doing emulsion measurements is stressed. (auth)

4911

NUCLEAR DISINTEGRATIONS PRODUCED BY COSMIC RAY PARTICLES IN A HIGH PRESSURE CLOUD CHAMBER. F. W. Bullock (Univ. Coll., London). Proc. Phys. Soc. (London) A70, 134-41(1957) Feb.

Cosmic ray stars produced in argon at 75 atmospheres pressure have been analyzed to give size distributions and angular distributions of the prongs. In a discussion of the star-producing flux entering the chamber, the natural rate of occurrence of interactions in the chamber is compared with rates obtained by other workers. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

4912 AEC-tr-2839

LATTICE DEFECTS IN IONIC SOLIDS. F. G. Fumi. Translated from Nuovo cimento (9) 12, Suppl. 1, 67-76 (1954). 8p.

ELECTRICAL DISCHARGE

4913

CONTROLLED CORPUSCLE BEAM DISCHARGES. A PROPOSED NEW METHOD FOR ATTAINING HIGH TEMPERATURES AND ENERGY DENSITIES. B. W. Schumacher (Ontario Research Foundation, Toronto). Can. J. Phys. 35, 239-40(1957) Feb.

The proposed scheme for the production of high-temperature plasma is based on controlled discharges of corpuscle beams into a high-density gas. Preliminary studies indicate higher temperatures may be attained with greatly reduced containment problems. (D.E.B.)

ELECTRONS

4914 NBS-C-577

National Bureau of Standards, Washington, D. C.

ENERGY LOSS AND RANGE OF ELECTRONS AND POSITRONS. Ann T. Nelms. July 26, 1956. 32p.

Tabulations of the mean energy loss due to ionization and excitation and the range derived from this quantity are given for electrons and positrons in several materials. (auth)

4915

MOMENTUM DISTRIBUTION OF METALLIC ELECTRONS BY POSITRON ANNIHILATION. A. T. Stewart (Atomic

Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 168-83(1957) Feb.

The angular correlation of photons from the two-photon decay of positrons has been measured for positrons annihilating in some 34 elements, mostly metals. These data give the momentum distribution of photons and hence of the center of mass of the annihilating electron-positron pairs. The momentum distributions are discussed in terms of the velocity dependence of the annihilation probability. It is concluded that the observed momentum distributions are primarily the momentum distributions of the conduction electrons in the metals. A higher momentum component is observed, which is attributed to ion core effects. (auth)

GASES

4916

DRIFT VELOCITIES OF ELECTRONS IN SOME COMMONLY USED COUNTING GASES. T. E. Bortner, G. S. Hurst, and W. G. Stone (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 28, 103-8(1957) Feb.

The original method of Stevenson has been used to develop an apparatus capable of yielding high precision for the drift velocities of electrons moving in an electric field. Measurements have been made of the electron drift velocity in A, N_2, CH_4, CO_2, C_2H_4, cyclopropane, and a few mixtures of some of these gases. The results for A and N_2 agree with those of Nielsen. (auth)

INSTRUMENTS

4917 CF-57-2-144

Oak Ridge National Lab., Tenn.

CAPILLARY FLOWMETER. E. C. Hise. Feb. 20, 1957. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80 (mf OTS).

The experimental flowmeter constructed performed almost exactly as the design calculations predicted. It is capable of reading flows from approximately 0.2 cc to 10 cc of water per hour. The range of the flowmeter can be altered, as use testing on the HRT and the HRT mockup dictates, by changing the length of the capillary tube and/or the range of the D. P. Cell. Capillary flowmeters can be accurately designed for extremely small flows, the practical lower limit being dependent upon the possibility of plugging. (auth)

4918 HEPL-33

Stanford Univ., Calif. High-Energy Physics Lab.

THE QUADRUPOLE MAGNET AS A FOCUSING DEVICE. Technical Report [on] LINEAR ELECTRON ACCELERATOR PROJECT. Robert N. Carlile. Feb. 1957. 60p. Contract N6onr-25116.

The basic concepts of the first-order dynamics of a particle in the field of a quadrupole magnet are reviewed. Descriptions are included on the suspended-wire method of measuring parameters which describe the focusing properties of a quadrupole. The results of applying these methods to a specific quadrupole are presented. Discussions of the principal planes and focal length in the horizontal plane of a wedge magnet are included in an appendix. (B.J.H.)

4919 KAPL-M-AME-3

Knolls Atomic Power Lab., Schenectady, N. Y.

THE MAGNETIC DENSITOMETER. Robert H. Jones. Dec. 28, 1956. Decl. Feb. 28, 1957. 13p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

The magnetic densitometer utilizes the magnetic field of a low-frequency oscillator in its operation. This constant field is applied with a coil probe to a metal sample. As the sample is moved relative to the probe (magnetic field) a signal is produced when discontinuities in the sample enter the field. The basic instrument and its operation are described. (auth)

4920 NP-6220

Mine Safety Appliances Co., Callery, Penna.

TEST OF PROPOSED DESIGN S1G BELLOWS IN SODIUM. Memo Report 100. G. E. Kennedy and E. C. King. Dec. 22, 1955. 7p. Contract NObs-65426.

Twenty stainless steel bellows of the proposed S1G design have been tested, by cycling through a 3-in. stroke, while immersed in approximately 850°F sodium and under external pressure. Sixteen of these bellows were tested at a cycle rate of 12 per min. The last four bellows were tested with a 4 min time delay between each half cycle. Under these latter conditions, two bellows, made by Breeze Manufacturing Company, were cycled without failure in excess of 87,000 times. All the other bellows failed by leaking except one in which the stem bound. (auth)

4921

PHASE DETECTOR FUNCTIONING WITHOUT LOW FREQUENCY MODULATION FOR THE OBSERVATION OF NUCLEAR MAGNETIC RESONANCE AT VERY LOW FREQUENCIES. Jean-Michel Rocard, Georges J. Bene, and Richard C. Extermann. Compt. rend. 244, 887-9(1957) Feb. 11. (In French)

4922

PRECISE NUCLEAR RESONANCE THERMOMETER. G. B. Benedek and T. Kushida (Harvard Univ., Cambridge, Mass.). Rev. Sci. Instr. 28, 92-5(1957) Feb.

The properties of a thermometer based upon the temperature variation of the pure quadrupole resonance frequency (ν_0) of the Cl^{35} nucleus in granular $KClO_3$ have been investigated. In the range $\sim 10°K < T < 300°K$, the thermometer has a very high sensitivity, being better than $\pm 0.002°$ at 273°K and $\pm 0.004°$ at 77°K. The accuracy at 20°K is estimated as at least $\pm 0.02°$ The thermometer is exactly reproducible if care is taken that the $KClO_3$ is of high chemical purity. No hysteresis effects were observed. Establishment of the thermometer requires a single precise determination of the ν_0 versus temperature curve using the fundamental temperature standards to measure the temperature. (auth)

4923

CONTINUOUSLY VARIABLE HIGH CURRENT RHEOSTAT. S. G. Sydoriak and T. R. Roberts (Los Alamos Scientific Lab.,N. Mex.). Rev. Sci. Instr. 28, 143(1957) Feb.

4924

ALPHA-PARTICLE THICKNESS GAUGE. H. A. Enge and M. A. Wahlig (Massachusetts Inst. of Tech., Cambridge, Mass.) and I. Aanderaa (Univ. of Bergen, Norway). Rev. Sci. Instr. 28, 145-6(1957) Feb.

ISOTOPES

4925 CF-57-2-97

Oak Ridge National Lab., Tenn.

PRELIMINARY ESTIMATE OF THE COST OF PRODUCTION OF 10% ISOTOPIC PURITY OXYGEN-17 BY CHEMICAL EXCHANGE. B. B. Klima. Feb. 1, 1957. 52p. Contract [W-7405-eng-26]. $9.30(ph OTS); $3.60(mf OTS).

An order of magnitude estimate was made to determine a minimum cost for 10% pure O^{17} when produced by a chemical exchange process. The calculations were based on separations factors of 1.03, 1.01, and 1.003. The cost of product was found to vary from $23 per gram for the larger factor to $165 per gram for the smaller. (auth)

4926

STUDIES ON THE RELATIVE ABUNDANCES OF ISOTOPES. L. H. Ahrens (Oxford Univ., Eng.). Geochim. et Cosmochim. Acta 11, 1-27(1957) Jan.–Feb.

Trends and variations of relative abundance are apparent in general (all isotope species) N,Z isotope-abundance diagrams or charts. For critical study, different isotope species (even Z, even N; even Z, odd N and odd Z, even N) must be examined separately. The most conspicuous feature about the even Z, even N species is a regular and profound relative abundance variation between N = 30 (Z = 28) and highly favored N = 50. Though highly favored N = 82 also strongly affects the relative abundances of even Z, even N isotopes, no comparable development precedes this neutron number. There is, however, a distinct relative abundance displacement at Z = 52 Te which appears to have significant consequences. Relative-abundance distribution and variations of even Z, odd N isotopes do not in general appear to be related to those involving even Z, even N species. The relative abundances of isotopes of the thirteen odd Z elements with two (both even N) isotopes seem to vary closely with neutron excess. Three regularities may be distinguished. One which involves Rb–Sb–Re, the only odd Z elements with one isotope a neighboring isobar, becomes linear when allowance is made for decay of Rb^{87} and Re^{187} over a period of $\sim 5000 \times 10^6$ years. Principal isotopes of even Z–odd Z neighboring elements tend to occur as isotonic pairs, often in quite well-defined sequences; these are interrupted at and immediately following N = 20, 50, and 82. The odd Z component of each such isotopic pair has the greater neutron excess up to N = 34, but the reverse holds after N = 44; this relationship is disturbed at and immediately following N = 50 and 82. (auth)

4927

NEW NEUTRON-DEFICIENT ISOTOPES OF RHENIUM. B. C. Haldar and Edwin O. Wiig (Univ. of Rochester, N. Y.). Phys. Rev. 105, 1285-7(1957) Feb. 15.

Three new activities have been observed in rhenium obtained by bombardment of rhenium and of tungsten with protons of energies from 40 to 240 Mev and of enriched W^{180} with 10-Mev protons. Positron-emitting Re^{177} of 17-minute half life was identified through its daughter, the known 2.2-hr W^{177}. Evidence is presented for the assignment of Re^{178} to a 15-min, 3.1-Mev positron activity and of Re^{180} to a (20 ± 1)-hour, 1.9-Mev positron activity. A previously reported unknown Re activity of approximately 1-hr half life, which may possibly be an isomer of Re^{186}, was also observed. (auth)

4928

NEW RADIOISOTOPE OF PLATINUM — Pt^{200}. L. P. Roy, Jean-Claude Roy, and Janet S. Merritt (Atomic Energy of Canada Ltd., Chalk River, Ontario). Phys. Rev. 105, 1337-8(1957) Feb. 15.

A new radioisotope of platinum, Pt^{200}, with an 11.5-hr half life has been produced by successive neutron capture in Pt^{198}. It was identified by milking its daughter, Au^{200}. The activation cross section for the reaction $Pt^{199}(n,\gamma)Pt^{200}$ is approximately 15 barns. (auth)

4929

THE NUCLIDES OF MOLYBDENUM AND TECHNETIUM IN FISSION CHAINS 102 AND 105. J. Flegenheimer and W. Seelmenn-Eggebert. Publs. com. nacl. energia atomica (Buenos Aires) Ser. quim. 1, No. 7, 63-79(1956). (In Spani

A half life of 5 ± 1 sec was found for the technetium daughter of the 11-minute molybdenum present in the fission products, whose probable mass number is 102. Absorption measurements show a maximum beta energy of 4.4 ± 0.3 Mev. From the absorption curves a half life of 11.5 ± 0.5 min is found for Mo^{102}. The Tc^{105} half life was found to be 10 ± 1 min through timed precipitations from a stock solution of fission technetium and measurements of the Ru^{105} formed. Ru^{106} as a radioactive indicator was used to show the purity of technetium isolations or to avoid weighing when distilling ruthenium. Through technetium isolations from quickly purified fission molybdenum, an upper limit of 2 minutes could be established for the half life of Mo^{105}. No other technetium half lives were found when milking from fission molybdenum. (auth)

MATHEMATICS

4930 DTMB-1100

David W. Taylor Model Basin. Applied Mathematics Lab., Carderock, Md.

RDR 4 INSTRUCTION MANUAL. DAVID TAYLOR MODEL BASIN ONE-DIMENSIONAL, ONE-GROUP TRANSPORT THEORY ROUTINE NO. 4 FOR NUCLEAR REACTOR DESIGN. Charles W. Dawson and Erwin H. Bareiss. Dec. 1956. 12p.

Previously issued in limited edition as Technical Report No. 19, dated Oct. 1956.

4931 ORNL-2177

Oak Ridge National Lab., Tenn.

RADIATION FLUXES IN A CYLINDRICAL CAVITY RESULTING FROM AN IDEALIZED ENTERING CURRENT. C. D. Zerby. Mar. 11, 1957. 37p. Contract W-7405-eng-26. $0.30(OTS).

The equations for the contribution to the radiation flux in a cylindrical cavity coming from the current entering through the curved surface are developed for two cases. In one case the cylinder is of finite length and the flux is obtained along the centerline. In the other case the cylinder extends to infinity in one direction from the plane in which the flux is determined along the radial from the center. In each case the entering current is idealized to have an angular distribution with an axis of symmetry which is not necessarily along the normal to the surface. (auth)

4932

TABLES FOR COMPUTING BIVARIATE NORMAL PROBABILITIES. Donald B. Owen (Sandia Corp., Albuquerque, N. Mex.). Ann. Math. Statistics 27, 1075-90(1956) Dec.

MEASURING INSTRUMENTS AND TECHNIQUES

4933 AECU-3416

Leeds and Northrup Co., Philadelphia.

NEUTRON-SENSITIVE THERMOPILE FOR REACTOR APPLICATIONS. Progress Report No. 1 [for] Period Ending December 1, 1956. D. Robertson. 18p. For [Knolls Atomic Power Lab. Contract W-31-109-Eng-52, Sub] contract K-302. $3.30(ph OTS); $2.40(mf OTS).

The over-all design of a neutron-sensitive thermopile is shown. Data on its ambient temperature range are given, and discussions and calculations are included on its temperature rise, sensitivity, time constant, measuring range, and accuracy. (B.J.H.)

4934 BNL-429

Brookhaven National Lab., Upton, N. Y.

IONIZATION CHAMBER RADIOISOTOPE COMPARATOR. R. I. Weller. Nov. 1956. 7p. $0.15(OTS).

A precision instrument for the routine measurement of liquid β-emitting radioisotopes was developed by modifying a portable Chang and Eng fast neutron detector. The battery-powered unit is rugged and dependable, and assays can be made rapidly. The minimum radioactivity measurable is of the order of 0.1 μc/ml and extends upward by

a factor of 10^5. The inherent accuracy of the comparator is within ± 2% and the over-all absolute accuracy is estimated as ± 5%. (auth)

4935 HW-43541

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

AUTOMATIC SAMPLE CHANGER. M. O. Rankin and R. A. Harvey. Jan. 3, 1957. 16p. Contract W-31-109-Eng-52. $0.20(OTS).

An automatic system was developed for counting, char ing, and recording data on laboratory samples. This system significantly increases the number of samples that can be handled daily. The system consists of three principal sections; a servo-system for changing samples, a commercial detector and scaler, and a 35-mm camera for data recording. (D.E.B.)

4936 UCRL-3590

California. Univ., Berkeley. Radiation Lab.

THE GENEVA CLOUD CHAMBER. Wilson M. Powell and Larry O. Oswald. Nov. 30, 1956. 13p. Contract W-7405-eng-48. $0.20(OTS).

A diffusion-type cloud chamber 4-ft. square was designed and built for exhibition at the Atoms for Peace Conference in Geneva, Switzerland. The necessary thermal gradient in the chamber was established and held by a refrigerator unit. One external electrical connection and a minimum of maintenance were the chief advantages of this chamber. (auth)

4937 UCRL-4762

California. Univ., Livermore. Radiation Lab.

A FILM TECHNIQUE FOR DOSIMETRY OF Am^{241}. George E. Wilcox and Jason L. Minkler. Nov. 9, 1956. 14p. Contract W-7405-eng-48. $0.15(OTS).

This report is a study of film response to Am^{241} radiation, using du Pont type 558 dosimeter film packets. On the basis of this response, an attempt was made to assign roentgen-values to given film densities. (auth)

4938

MODIFICATION OF THE DEPTH DOSE CURVES OF VARIOUS RADIATIONS BY INTERPOSED BONE. Lewis L. Haas and Glen H. Sandberg (Univ. of Illinois, Chicago). Brit. J. Radiol. 30, 19-26(1957) Jan.

4939

A "CHARGE-TRANSFER" DEVICE FOR USE IN INTEGRATED DOSE MEASUREMENTS WITH IONIZATION CHAMBERS, WITH AN APPLICATION TO ROTATIONAL THERAPY MEASUREMENTS. L. A. W. Kemp (The London Hospital, Eng.). Brit. J. Radiol. 30, 47-9(1957) Jan.

4940

DOSAGE DISTRIBUTIONS FROM "HAIRPINS" OF RADIOACTIVE TANTALUM WIRE. J. L. Haybittle (Addenbrooke's Hospital, Cambridge, Eng.). Brit. J. Radiol. 30, 49-52 (1957) Jan.

4941

X-RAY SPECTRUM FROM A BERYLLIUM WINDOW TUBE. I. SCINTILLATION SPECTROMETRY. P. K. S. Wang, R. J. Raridon, and Marvin Tidwell (Vanderbilt Univ., Nashville, Tenn.). Brit. J. Radiol. 30, 70-5(1957) Feb.

4942

IMPROVED SCINTILLATING MEDIA FOR RADIATION DOSIMETRY. E. H. Belcher and J. E. Geilinger (Royal Cancer Hospital, London). Brit. J. Radiol. 30, 103-5(1957) Feb.

An improved scintillating medium for radiation dosimetry with energy response varying by less than ± 10 per cent over the energy range 20 kev to 2 Mev has been developed. The medium consists of polystyrene/p-terphenyl/tetraphenylbutadiene plastic containing 1 part in 300 by weight of silver-activated zinc sulfide. The light output of this material compares favorably with that of the pure plastic. The effects of probe dimensions and wall composition on the performance of probe-type dose-rate meters incorporating this material are described. (auth)

4943

COMPENSATED IONIZATION CHAMBER FOR THE CONTROL OF THERMAL REACTORS. J. Duchene, J. Lavergne, and J. Weill. J. Nuclear Energy 4, 26-32(1957) Jan.

A γ-ray compensated B^{10} ionization chamber is described. Emphasis has been placed on obtaining an efficient adjustable compensation, so as to reduce the γ-ray current by 300- to 600-fold. This chamber, particularly well suited for reactor control, has a sensitivity of 2×10^{-14} amperes per neutron cm^{-2} sec^{-1}. Detection of a minimum flux of 5 neutrons cm^{-2} sec^{-1} is possible with a 10% precision in presence of 0.4 r/hr of γ radiation. Precision of 1% is obtained for a maximum of 5×10^5 neutrons cm^{-2} sec^{-1} in a γ field of 4×10^6 r/hr. (auth)

4944

THERMAL QUENCHING IN ALPHA- AND GAMMA-EXCITED FLUORESCENT SOLUTIONS. H. H. Seliger and C. A. Ziegler. J. Research Natl. Bur. Standards 58, 125-6(1957) March.

The effects of reduction of temperature on the relative light outputs of the gas-free liquid scintillators, DPO, αNPO, and PBD + POPOP, dissolved in xylene, have been investigated. From room temperature down to −35° C the relative light outputs increase markedly under both alpha and gamma excitation. Under the conditions of the present experiments it has been possible to make a gas-free solution of PBD + POPOP in xylene more efficient than crystal anthracene. (auth)

4945

AN EMULSION SPECTROGRAPH—A NEW TECHNIQUE FOR THE DETERMINATION OF THE MOMENTA OF FAST CHARGED PARTICLES. PART I. DESIGN CONSIDERATIONS AND THEORY. A. J. Apostolakis and I. Macpherson (Univ. of Durham and Univ. of Manchester). Proc. Phys. Soc. (London) A70, 146-53(1957) Feb.

An account is given of a relatively simple device by which the signs and momenta of fast, charged particles can be measured accurately. The particles traverse normally a stack of thin layers of emulsion, separated by large gaps, in a magnetic field. Particle trajectories are reconstructed after the emulsions are developed. Consideration is given in Part I of the paper to the requirements that a stack must satisfy in order to give a maximum detectable momentum of 300 bev/c. In Part II the construction of an actual stack will be described and an account will be given of some applications. (auth)

4946

AN EMULSION SPECTROGRAPH—A NEW TECHNIQUE FOR THE DETERMINATION OF THE MOMENTA OF FAST CHARGED PARTICLES. II. CONSTRUCTION AND APPLICATIONS OF A NORMAL INCIDENCE STACK. A. J. Apostolakis and I. Macpherson (Univ. of Durham and Univ. of Manchester). Proc. Phys. Soc. (London) A70, 154-64 (1957) Feb.

4947

CALCULATION OF CORRECTIVE COILS FOR A SOLENOID TYPE β SPECTROMETER AND MEASUREMENT OF THE MAGNETIC FIELD PRODUCED BY THE SOLENOID WITH CORRECTIVE COILS. Horacio E. Bosch. Publs. com. nacl. energia atomica (Buenos Aires) Misc. No. 2, 1–10 (1956). (In Spanish)

Two types of correcting coils were calculated to make the magnetic field homogeneous along its central axis over 40 cm. Also the intensity of the total magnetic field produced by the solenoid and the correcting coils in both cases were calculated. The relative errors of the value of the field at a point distant 20 cm when checked against the value of the field in the center, are of the same order for the two types. Relative measurements were made of the intensity of the total magnetic field along the central axis and along four parallels. The results show that a homogeneity of 1% can be obtained over 40 cm along the above mentioned axis. (auth)

4948

PROPANE BUBBLE CHAMBER IN A HIGH MAGNETIC FIELD. Larry O. Oswald (Univ. of California, Berkeley). Rev. Sci. Instr. 28, 80-3(1957) Feb.

A liquid C_3H_8 chamber 3.25 by 6.5 by 13 in., operating in a magnetic field of 22,000 gauss, is described. A simple compact dark-field type of illumination is used. For personnel and equipment safety a secondary pressure vessel is incorporated in the design. Special reference is given to some of the construction and design problems. A brief summary of the operation of the propane chamber in the 6.2-Bev neutron beam is given. (auth)

4949

LINEAR GATE OF 200 MILLIMICROSECOND DURATION. E. L. Garwin and A. S. Penfold (Univ. of Chicago, Ill.). Rev. Sci. Instr. 28, 116-19(1957) Feb.

An electronic gate circuit is described which has better than 1% linearity for pulses in the range 1 to 70 volts. The circuit gives an inverted output with a gain very close to unity and accepts positive inputs. The leakage of a 70-volt pulse through the closed gate is 0.6 volt and the largest negative going portion of the gating transient is 0.2 volt. The gate can be reliably opened with positive trigger pulses in the range 4 to 9 volts and the time jitter over this range is the same as the rise time of the trigger pulses. The inherent rise time of the gate output is about 50 millimicroseconds. (auth)

Refer also to abstract 4916.

MESONS

4950 AEC-tr-2840

SPIN AND PARITY OF THE τ-MESON. I. I. Gurevich and A. P. Mishakova. Translated from Doklady Akad. Nauk S.S.S.R. 105, 451-3(1955). 5p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 10-2850. (B.J.H.)

4951

INTERACTIONS AND DECAY OF POSITIVE K-PARTICLES IN FLIGHT. W. W. Chupp, G. Goldhaber, S. Goldhaber, E. L. Hoff, and J. E. Lannutti (Univ. of California, Berkeley) and A. Pevsner and D. Ritson (Massachusetts Inst. of Tech., Cambridge). Nuovo cimento (10) 4, Suppl. 2, 361-6(1956).

Stacks of Ilford G5 emulsions were exposed in the focused K^+ beam of the Berkeley Bevatron. Descriptions of all inelastic scattering events are included. The observed inelastic and elastic scatters are compared with expected Coulomb scattering. Sixteen decays in flight were also observed. (B.J.H.)

4952

INTERACTION LENGTHS AND DIFFRACTION SCATTERING OF 4.2 GEV π^- MESONS IN G5 EMULSION. J. O. Clarke (Univ. of Manchester) and J. V. Major (Univ. of Durham). Phil. Mag. (8) 2, 37-48(1957) Jan.

A large block of G5 emulsion has been exposed to the 4.2-βev π^- meson beam of the Berkeley Bevatron and 120 m of π^--meson track scanned. The total interaction length is found to be (27.1 ± 2.4) cm and the individual interaction lengths for the production of stars and scatters are (38.7 ± 3.5) cm and (90^{+23}_{-15}) cm, respectively. The geometrical interaction length is 28.4 cm. Good agreement with diffraction scattering theory is found for the observed angular distribution of the secondaries in the elastic scattering events. (auth)

4953

ENERGY DISTRIBUTION OF DECAY PIONS OF SOME τ^+-MESONS. D. J. Holthuizen, T. G. Lim, and S. J. Bosgra. Physica 23, 179-80(1957) Feb.

Data on 18 τ^+ mesons which stopped in Ilford G5 nuclear emulsion plates exposed to the Berkeley Bevatron were analyzed. Energies of the secondary π mesons from the τ decay are tabulated. (B.J.H.)

4954

RESULTS FROM AN ENRICHED NEGATIVE K-MESON BEAM. W. H. Barkas, W. F. Dudziak, P. C. Giles, H. H. Heckman, F. W. Inman, C. J. Mason, N. A. Nickols, and F. M. Smith (Univ. of California, Berkeley). Phys. Rev. 105, 1417(1957) Feb. 15.

Measurements obtained from the interaction and decay of K^- mesons in emulsion are briefly summarized. (B.J.H.)

Refer also to abstracts 4972 and 5072.

METEOROLOGY

4955 NRL-Memo-536

Naval Research Lab., Washington, D. C.

A PROPOSED TRANS-OCEANIC SYSTEM FOR COLLECTING SURFACE METEOROLOGICAL DATA. H. J. Mastenbrook and A. D. Anderson. Nov. 1955. 16p.

An instrumented buoy, designed to collect and transmit data, which can be positioned over distances of several thousand miles using high-frequency direction-finding techniques, is proposed as a means of collecting meteorological data on a transoceanic scale. It is concluded, on the basis of technical and meteorological considerations, that a long-range weather buoy is feasible. Ships and ocean currents offer a means of delivery to regions of meteorological interest. An experimental program, including field evaluation, is recommended to further define the feasibility in terms of the effectiveness of buoy transmissions for positioning and data collection, component reliability, and drift trajectories. (auth)

MICROWAVES

Refer to abstract 5056.

NEUTRONS

4956

ON THE VALIDITY OF NEUTRON-DIFFUSION THEORY IN REGIONS WHERE THE CROSS-SECTIONS ARE SPACE-DEPENDENT. K. T. Spinney (Atomic Energy Research Establishment, Harwell, Didcot, Berks). J. Nuclear Energy 4, 44-50(1957) Jan.

The analogous equation to that of simple diffusion theory is derived from the transport equation. Its limitations are discussed and its solution is given in a special case. This solution is compared with the more exact result obtained by solving the transport equation by Carlson's S_n method. (auth)

NUCLEAR PHYSICS

4957

BORON COMPOUNDS FOR NUCLEAR APPLICATIONS. Gordon R. Finlay (Norton Co., Niagara Falls, Ont., Can.). Am Ceram. Soc. Bull. 36, 109-11(1957) March.

The boron isotope, B^{10}, is an effective absorber for thermal neutrons, and hence finds application in control and shielding. Elemental boron, boron carbide, and boron nitride are concentrated sources of this isotope (normally 18.8% of total boron content). These substances are ideal for shielding, because of their light weight, high density of absorbing atoms, lack of undesirable by-products, good stability and high melting points. The development, production, and applications of these three materials will be reviewed. Boron carbide has been employed embedded in plastic sheets, rolled into aluminum (Boral), hot-pressed, as a bonded block or as granular fill. (auth)

4958

ON THE KINEMATIC PROPERTIES OF A SYSTEM OF TWO DIRAC PARTICLES. H. Joos, J. Leal Ferreira, and A. H. Zimerman. Anais acad. brasil. cienc. 28, 253-74(1956).

A description of two Dirac particles by 16 component spinor wave functions is employed to show that every wave equations for such a system, which is invariant under reflection and rotation, can be decomposed into two independent groups of 8 radial equations. Considering these equations in a representation where the relative radial velocity is diagonal, they decompose into four differential and four algebraic equations. The latter can be used to eliminate the superfluous components of the wave functions; this elimination is applied to hamiltonians with Coulomb and Breit interactions. From the resulting exact equations, approximations are derived, which take into account the movement of the nucleus. (auth)

4959

ESTIMATED FISSION FRAGMENT MASSES. I. W. Hay and T. D. Newton (Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 195-207(1957) Feb.

The mass excesses, M−A, of atoms in the fission fragment region have been empirically estimated by extrapolation of β-decay Q-values using the regularities found by Way and Wood. The resulting estimates of the energy release in fission may indicate the most probable charge and, roughly, the range of charge for a given mass ratio of primary fission fragments. (auth)

4960

THE INTERACTION OF β DISINTEGRATION IN THE CASE WHERE PARITY IS NOT CONSERVED. Roger Nataf. Compt. rend. 244, 884-6(1957) Feb. 11. (In French)

In order to explain the identity of the masses and periods of θ^+ and τ^+ mesons whose disintegration products seem to be of different parity, T. D. Lee and C. N. Yang have proposed the idea that in weak interactions, parity is not conserved. The manner in which such an interaction modifies the conditions of Fierz and Mahmoud-Konopinski is discussed. (tr-auth)

4961

THE INTERACTION OF β DISINTEGRATION IN THE CASE WHERE PARITY IS NOT CONSERVED. Roger Nataf. Compt. rend. 244, 1031-3(1957) Feb. 18. (In French)

4962

A NEW METHOD FOR THE PREPARATION OF THIN FILMS OF RADIOACTIVE MATERIAL. D. J. Carswell and J. Milsted (A.E.R.E., Harwell). J. Nuclear Energy 4, 51-4(1957) Jan.

The material to be deposited is ejected as an organic solution from a fine capillary by the application of an electric field, and collected on a metal plate. Thin α sources giving good resolution of α energies have been prepared by this method, which may have other applications in nuclear investigations. (auth)

4963

NUCLEAR EXCITATION BY ELECTRONS. H. R. Robl (Office of Ordnance Research, U. S. Army). Nuclear Phys. 2, 641-50(1957) Feb. (In German.)

The excitation of nuclei by electrons is considered as the inverse process to electron scattering in transitions of nuclei to states of lower energy. The calculation of the cross sections does not make explicit use of nuclear matrix elements, but involves only the mean life times of the excited states. The cross sections are given for magnetic and electric multipole transitions of arbitrary order. The total cross sections for an electron energy of 10 mc^2 and for excitation energies between 0.2 and 5 mc^2 are shown. (auth)

4964

ON THE ISOCOVARIANCE PROPERTIES OF LEPTONS. P. Roman (R. Eotvos Univ., Budapest). Nuclear Phys. 2, 651-9(1957) Feb.

On the basis of a simple postulate regarding the weak interactions of baryons and leptons, the transformation character of leptons in isobaric space is determined and various selection rules are studied. The slow decay of strange particles is also considered. (auth)

4965

A MODEL OF AN UNSTABLE PARTICEL. V. Glaser (Institute Ruder Bosković, Zagreb) and G. Källén (Univ. of Copenhagen). Nuclear Phys. 2, 706-22(1957) Feb.

The details of the Lee model are worked out when the mass of the so-called V particle is larger than the sum of the masses of the N particle and the θ particle. In this case, the V particle is unstable and the corresponding eigenstate of the Hamiltonian does not exist. A wave packet of states with N and θ particles representing the unstable V particle is explicitly constructed, and its decay is studied. Throughout this investigation a cut off is used in the model and the renormalized coupling constant is assumed to be smaller than the corresponding critical value. In this way the complication with "negative probabilities" encountered earlier is avoided. (auth)

4966

ANGLE DISTRIBUTION BY PAIR PRODUCTION IN PHOTOGRAPHIC EMULSIONS. J. P. Roalsvig (Univ. of Oslo, Norway). Phil. Mag. (8) 2, 133-7(1957) Jan.

Ilford G5 emulsions were exposed at a 30-Mev betatron, and these plates were scanned for electron pairs. Data concerning the angle between the photon direction and the direction of any one of the two pair electrons are included and are compared to theory. (B.J.H.)

4967

INTENSITIES AND SELECTION RULES OF MULTIPOLE RADIATIONS. Carlos G. Bollini. Publs. com. nacl. energia atomica (Buenos Aires) Ser. fis. 1, No. 8, 129-66 (1956). (In Spanish)

Interaction between an atomic electron and a radiation field is treated by representing the latter by means of electrical and magnetic spherical solutions from Maxwell equations. In this way a suitable formalism is achieved for the attainment of intensities and the corresponding selection rules, taking into account the conservation of total angular momentum. Thus, in the Schrödinger approximation, multipolar electric and magnetic radiations appear whose orders are between the addition and the difference of azimuthal quantum numbers from the initial and final states of a transition. The effects of spin and the

purely relativistic effects produced on the selection rules are found and accurate and approximate formulas are inferred for interaction matrixes corresponding to Schrödinger, Pauli and Dirac approximations. Comparison among the last two allows the determination of the existing differences between relativistic formulas for small energies and Pauli approximation formulas. (auth)

4968

ANTINEUTRINO FLUX FROM A REACTOR. C. O. Muehlhause and S. Oleksa (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 105, 1332-4(1957) Feb. 15.

The antineutrino flux distribution from a thermal neutron reactor is determined from a measurement of the equilibrium beta-ray spectrum from thermal neutron fission of U^{235}. The antineutrino distribution is then folded in with the cross sections for $\bar{\nu}(p,n)\beta^+$ and $\bar{\nu}(d,2n)\beta^+$ as a function of antineutrino energy. This determines the average antineutrino pile cross sections, $\bar{\sigma}_p$ and $\bar{\sigma}_d$, respectively, for the above-cited reactions. The results are: $\bar{\sigma}_p = 6 \times 10^{-44}$ cm^2; $\bar{\sigma}_d = 2 \times 10^{-45}$ cm^2. (auth)

4969

ANTINEUTRINO DISINTEGRATION OF THE DEUTERON. Joseph Weneser (Brookhaven National Lab., Upton, N. Y. and Univ. of Illinois, Urbana). Phys. Rev. 105, 1335-7 (1957) Feb. 15.

The cross section for the antineutrino disintegration of the deuteron, $\bar{\nu} + d \rightarrow n + n + e^+$, is considered. The only important contribution to the cross section arises from a ^1S final nucleon state, and only the tensor part of the beta interaction is effective. The matrix element can be evaluated by the effective-range formulation well known from calculations of the photomagnetic disintegration of the deuteron. The cross section is evaluated for three antineutrino energies: 5.5, 8.5, 13.5 Mev. The results for this process would be the same if the neutrino were a Majorana particle. (auth)

4970

DEFORMATIONS OF HEAVY NUCLEI. Osamu Miyatake (Osaka City Univ., Japan), Yasukazu Yoshizawa (Osaka Univ., Japan), and Masao Toyama (Osaka Joshigakuen Junior Coll., Japan). Phys. Rev. 105, 1341-5(1957) Feb. 15.

The value of the distortion parameter of an even-even nucleus which is derived by using the experimental values of the energy of the first excited state, is much greater than that determined from the lifetime of the first excited state of the same nucleus. This discrepancy is explained by assuming that there is a sort of rotational character of the nuclear matter and that the protons are distributed in a region slightly smaller than the whole nucleus. The mechanism of large deformations of eleven even nuclei is explained by applying the strong-coupling theory. The coupling constants between the extra particles and the nuclear surface are much smaller than those which have been used previously. The energies of the first excited states are calculated. (auth)

4971

EXPERIMENTAL TEST OF PARITY CONSERVATION IN BETA DECAY. C. S. Wu (Columbia Univ., New York) and E. Ambler, R. W. Hayward, D. D. Hoppes, and R. P. Hudson (National Bureau of Standards, Washington). Phys. Rev. 105, 1413-15(1957) Feb. 15.

In order to test parity conservation in β decay, the angular distribution of the electrons coming from the β decays of polarized Co^{60} nuclei was measured. A schematic diagram is included of a cryostat which houses a cerium magnesium nitrate sample in which Co^{60} nuclei are polarized. The γ anisotropy and β asymmetry are plotted as a function of time. A large β asymmetry was observed, thus indicating the non conservation of parity. In order to investigate possible internal magnetic effects on the electron paths, a test source was prepared. No β asymmetry was observed with this specimen. (B.J.H.)

4972

OBSERVATIONS OF THE FAILURE OF CONSERVATION OF PARITY AND CHARGE CONJUGATION IN MESON DECAYS: THE MAGNETIC MOMENT OF THE FREE MUON. Richard L. Garwin, Leon M. Lederman, and Marcel Weinrich (Columbia Univ., New York). Phys. Rev. 105, 1415-17(1957) Feb. 15.

The confirmation of the nonconservation of parity in weak reactions was sought by studying the successive reactions $\pi^+ \rightarrow \mu^+ + \nu$ and $\mu^+ \rightarrow e^+ + 2\nu$. The experiments were performed by stopping in carbon the μ^+ beam formed by the decay in flight of π^+ mesons inside of a cyclotron. It was found that parity is not conserved in the two reactions. A value of $+2.00 \pm 0.10$ was assigned to the ratio of magnetic moment to spin for the free μ^+ particle. (B.J.H.)

NUCLEAR PROPERTIES

4973 CF-57-1-167

Oak Ridge National Lab., Tenn.

CROSS SECTION PROGRAM AT ORNL. J. A. Harvey and J. L. Fowler. Jan. 21, 1957. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Some data are reported on the cross section of the $Be^9(n,\alpha)He^6$ reaction. Cross sections of Y and Ti were studied for energies between 2.8 and 34 kev. Data on observed energy levels are listed. Latest results on neutron activation cross sections with Sb–Be neutrons are tabulated. (B.J.H.)

4974 LA-2014

Los Alamos Scientific Lab., N. Mex.

CHARGED PARTICLE CROSS SECTIONS. Nelson Jarmie and John D. Seagrave, eds. Feb. 1, 1957. 234p. Contract W-7405-Eng-36. $1.25(OTS).

Plots of cross sections for charged particle reactions with nuclei up to F^{19} are presented. (D.E.B.)

4975 NP-6226

Rio de Janeiro. Centro Brasileiro de Pesquisas Físicas.

THE FIRST EXCITED STATES OF THE C^{13}–N^{13} MIRROR PAIR. J. P. Davidson and J. J. Giambiagi. Dec. 15, 1955. 14p. (Notas de Física Vol. II, No. 12).

Calculations of the first excited states of the C^{13}–N^{13} mirror pair by a modified α-particle model are summarized. (B.J.H.)

4976

THE NEUTRON CAPTURE CROSS SECTIONS OF Pu^{238}, Pu^{242}, AND Am^{243} IN THE THERMAL AND EPICADMIUM REGIONS. J. P. Butler, M. Lounsbury, and J. S. Merritt (Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 147-54(1957) Feb.

Thermal neutron capture cross sections of 403 ± 8 b for Pu^{238}, 18.6 ± 0.8 b for Pu^{242}, and 73.6 ± 1.8 b for Am^{243} were measured by the activation method assuming 36.4 b for the thermal neutron cross section of Co^{59}. Samples of Pu were irradiated for 1 to 5 months in the NRX reactor. The growth of Pu^{239}, Am^{243}, and Cm^{244} was determined by mass analysis and by α spectrum analysis and total α counting. Resonance capture integrals of 3260 ± 280 b for Pu^{238}, 1275 ± 30 b for Pu^{242}, and 2290 ± 50 b for Am^{243} were found using Co and U^{238} as standards. Values of 48.6 b and 282 b were taken as the resonance integrals of Co^{59} and U^{238} respectively. The fission cross section of Pu^{242} was zero within experimental error. (auth)

4977

THE ANGULAR DISTRIBUTION AND YIELD OF THE REACTION $F^{19}(p,\alpha_0)O^{16}$. R. L. Clarke and E. B. Paul (Atomic

Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 155-67(1957) Feb.

The yield of the ground state α particles from the $F^{19}(p,\alpha_0)O^{16}$ reaction has been studied from an energy of 1.3 Mev to 2.7 Mev. The observed angular distributions were analyzed in terms of a Legendre polynomial expansion by the method of least squares. Six resonances were found in the energy region studied, at bombarding energies of 1.358, 1.709, 1.853, 2.11, 2.31, and 2.58 Mev. The widths and peak cross sections of these resonances are respectively: (54 ± 10 kev, 46 ± 5 mb), (140 ± 5 kev, 55 ± 6 mb), (132 ± 5 kev, 77 ± 8 mb), (75 ± 25 kev, 10 ± 2 mb), (80 ± 25 kev, 32 ± 5 mb), and (300 ± 25 kev, 51 ± 10 mb). Their spins, parities, channel spin mixtures, and partial widths are discussed. (auth)

4978

SEARCH FOR SUCCESSIVE NEUTRON CAPTURE REACTIONS ON Mg^{26}, Si^{30}, AND Cr^{54}. L. P. Roy and L. Yaffe (McGill Univ., Montreal). Can J. Chem. 35, 176-9(1957) Feb.

Stable nuclides exposed to intense neutron fluxes may produce second order reactions by successive capture of two neutrons. This method has been applied in the present work in an attempt to determine the pile neutron capture cross section of three unstable nuclides, namely: Mg^{27}, Si^{31}, and Cr^{55}. A maximum value of 0.04 barn has been obtained for the cross section of Mg^{27}. Assuming that Si^{32} and Cr^{56} are long-lived, minimal ratios of 600 and 270 years/barn respectively were obtained for $t_{½}$ $Si^{32}/\sigma Si^{31}$ and $t_{½}$ $Cr^{56}/\sigma Cr^{55}$. (auth)

4979

REACTOR PHYSICS. 10. James F. Hill (Reactor School, Harwell). Nuclear Power 2, 111-14(1957) March.

Changes in k resulting from changes in fissionable material content as U^{235} fissions and isotopes of Pu build up are discussed. The reactivity changes in a typical natural U graphite reactor are calculated. (W.L.H.)

4980

UPPER LIMIT FOR THE LIFETIMES OF EXCITED STATES OF Fe^{56} AND Ti^{46}. G. Bertolini. Nuclear Phys. 2, 660-3 (1957) Feb.

Using a high-resolution millimicrosecond time analyzer, an upper limit of $\approx 10^{-11}$ sec for the lifetimes of the two excited states of Fe^{56} following β^+ decay and for the lifetime of the first excited level of Ti^{46} was determined. (B.J.H)

4981

DIRECTIONAL CORRELATION MEASUREMENTS IN Fe^{57}. Torsten Lindqvist and Ernst Heer (Swiss Federal Institute of Tech. (ETH), Zurich). Nuclear Phys. 2, 680-6(1957) Feb.

The directional correlation of the 123-kev and 14-kev γ lines in Fe^{57} has been investigated. The mother nucleus is the 270 day Co^{57}, decaying by K capture to Fe^{57}. The influence of self absorption and scattering in the source as well as the influence of the chemical form of the source was investigated. In the correlation function $W(\theta) = 1 + A_2P_2(\cos\theta) + A_4P_4(\cos\theta)$ the coefficients A_2 and A_4 were determined as $A_2 = -0.024 \pm 0.003$, $A_4 = 0 \pm 0.01$. Mixing ratios of the γ rays are discussed. (auth)

4982

INELASTIC CROSS-SECTIONS FOR FISSION-SPECTRUM NEUTRONS. III. H. A. Bethe, J. R. Beyster, and R. E. Carter (Los Alamos Scientific Lab., N. Mex.). J. Nuclear Energy 4, 3-25(1957) Jan.

Three neutron threshold detectors, Np^{237} and U^{238} fission detectors and an $Al^{27}(n,p)Mg^{27}$ activation detector, were used in the cross section studies. The basic characteristics of the detectors are briefly reviewed. The use of group theory to study the behavior of a continuous spectrum of neutrons is also discussed. Various experimental arrangements are described. A detailed discussion of the effects which may cause uncertainties or errors in a sphere transmission experiment is included. These effects include fast neutrons not produced by the source, room scattering of source neutrons, scattering from supports, nonthreshold neutron detection, γ-ray effects, spurious counter effects, and counter angular asymmetry. (B.J.H.)

4983

THE PILE-NEUTRON ABSORPTION CROSS-SECTION OF SAMARIUM-149. K. L. Aitken, D. J. Littler, E. E. Lockett, and G. H. Palmer (Atomic Energy Research Establishment, Harwell, Didcot, Berks). J. Nuclear Energy 4, 33-7(1957) Jan.

The pile-neutron absorption cross-section of natural samarium has been determined as 10,380 (±160) barns by making a comparison with boron in the GLEEP oscillator. Irradiation of a natural-samarium sample in the reflector of the NRX pile in Canada, and subsequent measurement of the change in its isotopic composition show that samarium-149 is the only significant contributor to the thermal-neutron absorption cross-section. Applying a small correction for epithermal absorption in the 147 and 152 isotopes, the pile-neutron absorption cross-section of samarium-149 is deduced to be 74,500 (±1100) barns. (auth)

4984

THE CROSS-SECTION FOR U^{238} FISSION BY FISSION NEUTRONS. R. B. Leachman and H. W. Schmitt (Los Alamos Scientific Lab., N. Mex.). J. Nuclear Energy 4, 38-43(1957) Jan.

The cross section for U^{238} fission by neutrons from the thermal-neutron-induced fission of U^{235} has been measured to be $(0.756 \pm 0.008)/\nu$ barn, where ν is the average number of neutrons emitted per U^{235} fission. Used with the most recent value of ν for U^{235}, $\nu = 2.46 \pm 0.03$, this gives 0.307 ± 0.005 barn for the U^{238} fission cross-section. (auth)

4985

DELAYED NEUTRON INVESTIGATIONS WITH THE ZEPHRY FAST REACTOR. PART I. PNEUMATIC TRANSFER SYSTEM. R. D. Smith, D. D. McVicar, and E. A. Thorne (Atomic Energy Research Establishment, Harwell, Didcot, Berks). PART II. THE DELAYED NEUTRONS ARISING FROM FAST FISSION IN U^{235}, U^{233}, U^{238}, Pu^{239}, AND Th^{232}. H. Rose and R. D. Smith (Atomic Energy Research Establishment, Harwell, Didcot, Berks). J. Nuclear Energy 4, 133-46(1957) Feb.

A pneumatic transfer system used in delayed neutron experiments is described. The system enabled small samples of fissionable materials to be irradiated near the reactor core for preset times of ½ sec or longer and transferred in less than one second to a remote neutron detector. The yields of five groups of delayed neutrons resulting from fast fission of U^{235}, U^{233}, U^{238}, Pu^{239}, and Th^{232} were investigated and compared with previous results. Some evidence was found that a short-lived precursor contributes to a small extent to the observed twenty-two-second group. (auth)

4986

INELASTIC CROSS-SECTIONS FOR FISSION-SPECTRUM NEUTRONS. IV. H. A. Bethe, J. R. Beyster, and R. E. Carter (Los Alamos Scientific Lab., N. Mex.). J. Nuclear Energy 4, 147-63(1957) Feb.

Detailed analyses are given of experimental data obtained with U^{238}, Np^{237}, and $Al^{27}(n,p)Mg^{27}$ threshold detectors. Two-group analyses are included for data on Fe and Cd. (B.J.H.)

4987

GAMMA-RAY YIELDS FROM THE RESONANT CAPTURE OF SLOW NEUTRONS. E. R. Rae and E. M. Bowey (Atomic Energy Research Establishment, Harwell, Didcot, Berks). J. Nuclear Energy 4, 179-90(1957) Feb.

A scintillation detector is described which is used in a time-of-flight experiment with the 15-Mev linear electron accelerator at Harwell for the measurement of gamma-ray yields from neutron capture. The efficiency and background of the apparatus are discussed. The gamma-ray spectra for the first ten levels in silver are compared, and the variation in detection efficiency from resonance to resonance is examined and shown to be small. On this basis the gamma-ray yield curves for silver are used to compute values of the quantity $\sigma_{0\gamma}\Gamma$ for each of the first ten levels. This quantity is of importance in the evaluation of the fundamental resonance parameters. The use of the apparatus with very small samples of material is also described. The high sensitivity is here utilized to obtain yield curves for separated isotopes, and so to assign resonances to the correct isotopes. (auth)

4988

870-kev LEVEL IN O^{17}. F. S. Mozer and F. B. Hagedron (California Inst. of Tech., Pasadena). Phys. Rev. 105, 1270-1(1957) Feb. 15.

The $O^{16}(d,p)O^{17*}$ reaction has been studied at an incident deuteron energy of 999.0 kev and a laboratory scattering angle of 135° to investigate the possible existence of a doublet level in O^{17} near 870 kev. No evidence of such a doublet was observed. By accurate determination of target surface contamination and instrument calibration constants, the Q value for this reaction was measured to be 1049.0 ± 2.2 kev. (auth)

4989

ENERGY LEVELS IN Ga^{69} FROM THE DECAY OF Ge^{69}. Rudi H. Nussbaum and Sital K. Suri (Indiana Univ., Bloomington). Phys. Rev. 105, 1272-7(1957) Feb. 15.

Using beta- and gamma-scintillation spectrometers for γ-γ and β-γ coincidence experiments, the decay of Ge^{69} (40 hr) has been reinvestigated. The main positron branch (1.22 Mev; 93%) proceeds directly to the ground state of Ga^{69}. Probably nine higher levels are mainly excited by electron capture transitions. From coincidence relations a tentative decay scheme is proposed. The half life was found to be 40.4 ± 0.3 hr. (auth)

4990

LOW-ENERGY ACTIVATION FUNCTIONS FOR PHOTOFISSION OF U^{238} AND Th^{232}. R. A. Schmitt and R. B. Duffield (Univ. of Illinois, Urbana). Phys. Rev. 105, 1277-84(1957) Feb. 15.

Activation functions for symmetric and asymmetric photofission of U^{238} and Th^{232} have been determined over the energy range 4.5 Mev to 10 Mev. For both elements, the fission yield varied exponentially with betatron energy over the lowest energies covered and the data show the difficulty in establishing experimentally the existence of a threshold for photofission. The symmetric (Cd^{117}) photofission yield relative to the asymmetric (Ba^{139}) yield in U^{238} showed a local maximum of 0.05% at 6-Mev betatron energy, while the corresponding symmetric yield in Th^{232} rose steadily from < 0.0003% at 6.5 Mev to 0.1% at 12-Mev betatron energy. (auth)

4991

ANGULAR CORRELATION MEASUREMENTS IN THE DECAY OF Hg^{197}. Horace H. Coburn, John V. Kane, and Sherman Frankel (Univ. of Pennsylvania, Philadelphia). Phys. Rev. 105, 1293-1300(1957) Feb. 15.

Measurements of the e_K^-, e_L^-, and e_{M}^--γ, e_{L+M}^--e_K^- and e_L^-, and γ-γ angular correlation coefficients in sources of different chemical compositions in the $^{13}/_2(M4)^5/_2(E2)^1/_2$ cascade of 24-hour Hg^{197} have been carried out in a study of the effects of extranuclear fields on angular correlation measurements. Measurement of the γ-γ correlation in dilute mercuric nitrate solutions yields $A_2 = 0.214 \pm 0.037$ in agreement with the theoretical value for this cascade. Solid $Hg(NO_3)_2$ sources show an attenuation of the γ-γ coefficient, $g_2 = 0.51 \pm 0.16$. The e_K^--γ coefficients are attenuated relative to the theoretical coefficients by the factor $g_2 = 0.47 \pm 0.03$. The role of the effects of internal conversion on the attenuation of correlation coefficients is examined in terms of these measurements and those of other authors on Hg^{197}, Hg^{199}, and Ta^{181}. (auth)

4992

COMPARISON OF ENERGY LEVELS OF Li^6 FROM VARIOUS REACTIONS. C. P. Browne and C. K. Bockelman (Massachusetts Inst. of Tech., Cambridge, Mass.). Phys. Rev. 105, 1301-6(1957) Feb. 15.

The nuclear energy levels of Li^6 of excitations less than 5 Mev were studied by using inelastic scattering of deuterons and protons and the $Be^9(p,\alpha)Li^6$ reaction. An electrostatic accelerator and a broad-range magnetic spectrograph gave high precision and resolution. Levels were observed at 2.188 ± 0.006 Mev and at 3.560 ± 0.006 Mev, the former with all three reactions and the latter with all but deuteron scattering which is forbidden by the isotopic-spin selection rule. No other levels were observed. A study of the peak shapes yields 24 kev for the half width of the 2.188-Mev level, in agreement with previous measurements on the compound nucleus. (auth)

4993

DIFFERENTIAL CROSS SECTIONS FOR THE SCATTERING OF MEDIUM ENERGY PROTONS ON CARBON. Robert W. Peelle (Princeton Univ., N. J.). Phys. Rev. 105, 1311-23(1957) Feb. 15.

Extensive experimental results are presented showing the variation with energy of the absolute angular distributions for the elastic and inelastic scattering of medium energy protons on carbon. For the scattering with Q = 0 and Q = −4.4 Mev, angular distributions between 20 deg and 170 deg were obtained for eleven incident proton energies spaced between 14.0 Mev and 19.4 Mev. Distributions for scattering leading to the excitation of the 7.7-Mev and 9.6-Mev states of C^{12} were measured at energies of 16.7, 17.8, and 18.9 Mev. The experimental results are discussed qualitatively in their relation to the predictions of the theories of nuclear reactions. The elastic scattering cross sections are roughly what one might expect from the complex potential theory, but no numerical comparisons have been made. The predominant inelastic scattering is forward, though the angular distributions corresponding to the three levels studied do not resemble each other. In no single case is one of these distributions symmetrical about 90 deg. The simple Bessel-function distributions of the first-order direct interaction theory do not agree well with the data, but only the scattering leading to the 4.4-Mev level of C^{12} is in apparently complete disagreement. Experimental differential cross sections as a function of energy are also presented for the scattering of protons on hydrogen near 90 deg (center-of-mass system). (auth)

4994

INELASTIC SCATTERING OF 12-MEV PROTONS ON LITHIUM, CARBON, MAGNESIUM, AND SILICON. Homer E. Conzett (Univ. of California, Berkeley). Phys. Rev. 105, 1324-31(1957) Feb. 15.

The angular distributions of protons from the reactions $Li^7(p,p')Li^{7*}$ (Q = −4.61 Mev), $C^{12}(p,p')C^{12*}$ (Q = −4.43 Mev), $Mg^{24}(p,p')Mg^{24*}$ (Q = −1.36 Mev), and $Si^{28}(p,p')Si^{28*}$ (Q = −1.78 Mev) have been measured, and the cross sections for the reactions have been obtained. The lithium distribution has been analyzed in terms of (a) inelastic scattering proceeding through formation and decay of the compound nucleus, and (b) direct inelastic scattering of the Austern, Butler, McManus theory. An assignment of

$J = 5/2^-$ to the 4.61-Mev level of Li^7 is consistent with all the experimental evidence to date; however, the intermediate coupling shell model prediction of $7/2^-$ should not be ruled out completely. The carbon, magnesium, and silicon distributions indicate that the statistical theory of the compound nucleus does not apply and, also, that the direct-interaction type of scattering is negligible. It appears that the reactions involving these nuclei proceed through only a few or several levels of the intermediate nuclei. For each reaction, the cross section has been compared with estimates of the cross sections for formation of the compound nucleus. The results are in qualitative agreement with the theory of decay of the compound nucleus through competing channels. (auth)

4995

POSITRON SPECTRUM OF O^{15}. O. C. Kistner, A. Schwarzschild, and B. M. Rustad (Columbia Univ., New York and Brookhaven National Lab., Upton, N. Y.) and D. E. Alburger (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 105, 1339-41(1957) Feb. 15.

The positron spectrum of O^{15} has been investigated with two iron-free magnetic spectrometers. One measurement, performed with an intermediate-image spectrometer and a solid source, gave an end-point energy of 1.723 ± 0.005 Mev. The other measurement, performed with a thin-lens spectrometer and a gaseous source, gave an end-point energy of 1.736 ± 0.010 Mev. These values, which are approximately 0.050 Mev higher than the only previously reported spectrometer measurement, are in good agreement with the end point predicted from $N^{15}(p,n)O^{15}$ threshold determinations. The ft value calculated from an average end-point energy of 1.733 ± 0.005 Mev derived from the beta spectra and the (p,n) threshold measurements is 4280 ± 100 seconds. This new value brings the O^{15} decay into good agreement with the B—x analysis of the 0–0 spin change and the "doubly closed shell plus or minus one nucleon" beta transitions. (auth)

4996

POLARIZATION OF γ RAYS IN Ta^{181}. P. H. Stelson and F. K. McGowan (Oak Ridge National Lab., Tenn.). Phys. Rev. 105, 1346-9(1957) Feb. 15.

Directional correlation measurements of the γ rays following the decay of Hf^{181} to excited states in Ta^{181} have indicated two possible spin assignments for the 482- and 615-kev states. Calculation of the expected polarization of the 482-kev γ rays in the 133–482 kev decay showed that this property was quite different for the two spin assignments. For the spin assignment 482, $9/2^+$, and 615, $5/2^+$ the calculated value of p is 1.10 where $p \equiv W(90°, 90°)/W(90°,0°)$ in the notation of Biedenharn and Rose. For the spin assignment 482, $5/2^+$, and 615, $1/2^+$ the value of p is 0.67. The experimental value for liquid HfF_4 source is (0.71 ± 0.05). To check on possible systematic errors, measurements were also made with a dry HfF_4 source for which one expects an attenuated value for p of 0.91. The experimental value is (0.88 ± 0.05). It is concluded that the correct spin assignments are 482, $5/2^+$, and 615, $1/2^+$. Reduced γ-ray transition probabilities are obtained. The collective model of the nucleus is used to interpret the low-lying states of Ta^{181}. (auth)

4997

PROPERTIES OF FERMIUM-253. Saadia Amiel (Univ. of California, Berkeley). Phys. Rev. 105, 1412-13(1957) Feb. 15.

The isotope Fm^{253} was identified and measured among the products of the reaction of Cf^{252} with 40-Mev α particles. The α energy spectrum of the Fm^{253} was measured in an ionization-grid chamber with a 48-channel α pulse-height analyzer. (B.J.H.)

4998

NUCLEAR RESONANT SCATTERING OF GAMMA RAYS IN ^{199}Hg. V. Knapp (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) A70, 142-5(1957) Feb.

The resonant nuclear scattering of the 209-kev gamma ray in Hg^{199} has been studied by the high speed rotor technique, and the decrease of scattering at speeds above the optimum has been observed. From the measured ratio of resonant scattering to Rayleigh scattering, and with allowance for internal-conversion transitions, the mean life of the 209-kev level is found to be $(7.8 \pm 1.2) \times 10^{-11}$ second. (auth)

4999

THE EFFECT OF ISOTOPIC SPIN IMPURITY ON (γ,p) AND (γ,n) CROSS SECTIONS. F. C. Barker and A. K. Mann (Australian National Univ., Canberra). Phil. Mag. (8) 2, 5-14(1957) Jan.

The presence of small isotopic spin impurity in an excited state of a self-conjugate nucleus can lead to large differences in the neutron and proton emissions from that state. This effect might be expected to be exhibited clearly in reactions involving a T = 1 excited state produced by E1 absorption, e.g., in a giant resonance state of photonuclear reaction. The photodisintegration data for C^{12} do in fact suggest that the (γ,p) and (γ,n) cross sections are more dissimilar than can be explained by penetrability considerations. From calculations based on the shell model it is found that, for an excited state appropriate to the giant resonance in C^{12}, an isotopic spin admixture of order 1% in intensity is required to fit the observed ratio of total cross sections. The angular distributions are sensitive to the details of the excited state wave function; however, if the calculated proton distribution is made to fit the observed distribution in the simplest way, a neutron distribution not very different from that for the protons is obtained. The photodisintegration of O^{16} and the reactions $B^{10}(\alpha,n)N^{13}$ and $B^{10}(\alpha,p)C^{13}$ are also briefly considered. (auth)

5000

ISOTOPIC SPIN SELECTION RULES. IX. THE 9.58 MEV STATE OF ^{16}O. S. D. Bloom, B. J. Toppel, and D. H. Wilkinson (Brookhaven National Lab., Upton, N. Y.). Phil. Mag. (8) 2, 57-60(1957) Jan.

The reaction $C^{12}(\alpha,\gamma)O^{16}$ through the 1– state of O^{16} at 9.58 Mev is detected and the radiative width measured as 6 Mev. This corresponds to $|M|^2 = 1 \times 10^{-5}$ in Weisskopf units or to a contamination of the predominantly T = 0 state with T = 1 or the ground state with T = 1 of $\alpha_0^2(1) \sim 3 \times 10^{-4}$. Alternatively if the transition is ascribed to a mixing-in by the Coulomb perturbation of the T = 1 state at 13.09 Mev $H^C \sim 0.035$ Mev is found. (auth)

5001

ISOTOPIC SPIN SELECTION RULES. X. THE 7.18 MEV STATE OF ^{20}Ne. B. J. Toppel, S. D. Bloom, and D. H. Wilkinson (Brookhaven National Lab., Upton, N. Y.). Phil. Mag. (8) 2, 61-2(1957) Jan.

The possible E1 transition between the 3– state at 7.18 Mev and the 2+ state at 1.63-Mev in Ne^{20} is forbidden by the isotopic spin rule. It has been sought using the reaction $O^{16}(\alpha,\gamma)Ne^{20}$ and it has been shown that the radiative width is less than 6 Mev. This corresponds to $|M|^2 \leq 4.3 \times 10^{-5}$ in Weisskopf units or to contaminations $\alpha_0^2(1) \leq 1.3 \times 10^{-3}$ of the 7.18- and 1.63-Mev states with T = 1 states. (auth)

5002

ISOTOPIC SPIN SELECTION RULES. XI. THE 8.06 AND 6.23 MEV STATES OF ^{14}N. D. H. Wilkinson and S. D. Bloom (Brookhaven National Lab., Upton, N. Y.). Phil. Mag. (8) 2, 63-82(1957) Jan.

The decay scheme of the 8.06-Mev 1–T = 1 level of N^{14} is reinvestigated using the reaction $C^{13}(p,\gamma)N^{14}$ at the 550-kev

resonance. The relative strength of the isotopic spin forbidden transition to the first excited state is 0.022 corresponding to $\alpha_1^2(0)_{8.06} \sim 0.061$. Owing to the great strength to it of the transition from the 8.62-Mev 0+ state it seems that the 6.23-Mev T = 0 state must be 1−. The decay of this state has been determined; it has been reached by this E1 transition from the 1.16-Mev resonance. The strength of the isotopic spin forbidden transition to the ground relative to the allowed transition to the first excited state is 0.31 corresponding to $\alpha_0^2(1)_{6.23} \sim 0.078$. The closeness of these two isotopic spin impurities suggests that these two states may be each other's chief contaminators and in this sense the forbidden transitions from the one is the same radiation as the allowed transition from the other and vice versa. If this suggestion is correct $H^C \sim 0.45$ Mev which large value suggests some close relationship between the two states. In unravelling the decay schemes subsidiary pieces of information are obtained; in particular it seems that the 5.69-Mev state is very probably 1+. (auth)

5003

MEASUREMENT OF FAST NEUTRON TOTAL CROSS SECTIONS. L. Cranberg, R. K. Beauchamp, and J. S. Levin (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 28, 89-92(1957) Feb.

A system is described for measuring high resolution (e.g., 1 kev) total neutron cross sections at high counting rate in the range above 50-kev neutron energy using as a neutron detector a thick proton recoil detector. The pulsed-beam time-of-flight technique is used to identify the neutrons of interest, which are produced in the target of an electrostatic accelerator. Energy modulation of the accelerator makes it possible to make observations at 100 energy points simultaneously. Illustrative results are given on the 585-kev resonance in S and on Al in the neighborhood of 585 kev. The gain in speed of taking data over conventional systems is greater than a factor of 100. (auth)

NUCLEAR REACTORS

5004 ANL-5651

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

DESIGN EVALUATION OF BER (BOILING EXPERIMENTAL REACTOR) IN REGARD TO INTERNAL EXPLOSIONS. F. B. Porzel. Jan. 1957. 108p. ARF Project DO90. For Argonne National Lab. Contract W-31-109-eng-38. $0.55(OTS).

An analysis of the safety aspects of the Argonne National Laboratory Boiling Experimental Reactor with regard to internal explosion has been made. On the basis of this analysis the reactor has been adjudged reasonably safe for the estimated release of 0.8×10^9 calories. The analysis covers the effect of a blast wave in free concrete, with detailed consideration of the shock wave equations of motion and the equation of state for solids. The impulse delivered to a surface from various pressure decay laws and the energy dissipation due to waste heat is presented in detail. Since the Boiling Experimental Reactor is surrounded by water, the reflection and transmission of shock waves at a water-concrete interface is treated very generally in the report. From a study of the rates of energy transfer across such interfaces and the resulting shock wave diffraction patterns, a protection scheme is developed. The various methods by which protection from shock waves can be provided are examined, and it is shown that a new type blast shield would be the most practical solution. The general background of the blast shield design is developed and the mechanism of absorption is discussed. The design rules are then applied to the Boiling Experimental Reactor and a blast shield of the proper materials and dimensions is developed. This design makes use of the properties of a number of materials from Celotex to concrete and will reduce the shock wave impulse below that which might damage the reactor structure. (auth)

5005 CF-54-6-135

Oak Ridge National Lab., Tenn.

A "THIN-SHELL" APPROXIMATION FOR TWO-GROUP, TWO-REGION SPHERICAL REACTOR CALCULATIONS. M. Tobias. June 16, 1954. Decl. Feb. 28, 1957. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

5006 CF-55-4-25

Oak Ridge National Lab., Tenn.

NOTES ON FISSION PRODUCT WASTES FROM PROPOSED POWER REACTORS. F. L. Culler, Jr. Mar. 4, 1955. Decl. Apr. 6, 1955. 31p. Contract [W-7405-eng-26]. $0.25(OTS).

Reactor design characteristics, operating problems, and fission product yields are reviewed. Current and proposed methods for the disposition of radioactive wastes and the influence of proposed power reactors using difficulty soluble fuel elements such as zirconium or stainless steel on the disposal of radioactive wastes are discussed. Economic requirements for waste disposal in a power economy are considered briefly. (C.H.)

5007 CF-56-7-126

Oak Ridge National Lab., Tenn.

A HOMOGENEOUS-REACTOR GAMMA IRRADIATION FACILITY. R. B. Briggs and J. O. Kolb. July 27, 1956. 16p. Contract [W-7405-eng-26]. $0.20(OTS).

A brief study was made of a meat-irradiation facility consisting of an aqueous homogeneous reactor and a source utilizing fission-product gases and their daughter products. It was estimated that a reactor power level of 15 Mw would be required to obtain a source that would irradiate 6 in. × 16 in. × 20 in. boxes of meat to a dose of 2×10^6 rep in 30 min and at a rate of 2800 lb/hr. Approximately $\frac{1}{4}\%$ of the reactor power would be emitted as energy of gamma photons in the source. Based on experience with the Homogeneous Reactor Test, it is believed that the entire facility would cost about $5.5 million. (auth)

5008 CF-56-8-11

Oak Ridge National Lab., Tenn.

PROCEDURE FOR DUMP TESTS—HRT TEST I B 2 a, b, c. Paul N. Haubenreich. Aug. 3, 1956. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The initial operation of the integrated reactor system will be with oxygenated water in the reactor. During this test, essentially all components will be operated with the reactor at design temperature and pressure. However, before the system is brought to the maximum temperature and pressure, a number of tests will be carried out to make sure that a possible inadvertent dump would not cause damage to the reactor. An outline of the planned dump experiment is given. The series begins with tests which will show up any gross inadequacies or malfunctions in the dump system without involving any danger to the reactor. Following this the reactor will be dumped from conditions at which the system may eventually operate for long periods of time. The program may be revised if test results show this to be necessary. Instrumentation will be provided so that the action of the dump valves and the valves in the pressurizer vent lines, and the resultant pressures in the fuel and blanket high-pressure systems and dump tanks can be studied. In addition, the operation of all pumps, valves, etc., affected by a dump will be observed. (auth)

5009 CF-57-1-65
Oak Ridge National Lab., Tenn.
INTERIM REPORT OF APPR IRRADIATION TEST PROGRAM AT MTR. E. E. Gross and L. D. Schaffer. Jan. 21, 1957. Decl. Mar. 1, 1957. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Burnup calculations for the APPR irradiation program are revised. Graphical data are given which relate % burnup of B^{10} atoms to the integrated flux for the APPR control rod which is being tested. A proposed irradiation schedule is included. (B.J.H.)

5010 CF-57-1-163
Oak Ridge National Lab., Tenn.
CRACKS IN HRT FLANGE BOLTS AND FERRULES. J. P. Hammond, G. M. Adamson, and T. M. Kegley, Jr. Jan. 29, 1957. 15p. Contract [W-7405-eng-26]. $3.30 (ph OTS); $2.40(mf OTS).

Cracks observed in some HRT flange bolts and ferrules led to Magnaglo inspection (a magnetic particle inspection using fluorescent dye) of the others. The defects are attributed to quench cracking. The present alloy and heat treatment are suitable. Plating with Zn instead of Cd to 0.0002 in. thickness, followed by H_2 relief treatment and a final bichromate dip is recommended. (T.R.H.)

5011 CF-57-2-5
Oak Ridge National Lab., Tenn.
CONTROL SYSTEM FOR HRT COOLING WATER. R. L. Moore. Feb. 11, 1957. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Additional circuits to provide control and protection for the revised HRT cooling water system are described. The circuitry provides against excess demineralized cooling water loop pressure and excess cooling water activity, insures containment of activity in explosions, and provides emergency cooling water from the tower basin. (T.R.H.)

5012 CF-57-2-9
Oak Ridge National Lab., Tenn.
EFFECT OF HRT CORE SAMPLE HOLDER UPON CORE FLOW PATTERN AND PRESSURE DROP. B. A. Hannaford. Feb. 4, 1957. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The measured pressure drop across the reactor core, with the sample holder in place, is 6.9 psi, more than twice the estimated value. Better estimates, based on more rigorous mathematical analysis, should be possible for future problems of this type. The 2% density difference which produced the relatively high velocity of approximately 1 fps, in this experiment, will result from a temperature difference of about 8°C. It is concluded that the bulk fluid temperature near the sample holder will be less than 8°C above the average temperature at the same elevation in the core. (auth)

5013 CF-57-2-34
Oak Ridge National Lab., Tenn.
EFFECT OF PRESSURE DIFFERENTIALS ON DEFLECTION OF THE OUTER FUEL PLATES OF BRAZED APPR FUEL ELEMENTS. J. H. Erwin and R. J. Beaver. Feb. 7, 1957. Decl. Mar. 1, 1957. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

5014 CF-57-2-36
Oak Ridge National Lab., Tenn.
FUEL COSTS IN BATCH- AND CONTINUALLY-PROCESSED HOMOGENEOUS REACTORS. P. R. Kasten and R. E. Aven. Feb. 8, 1957. 39p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

The fuel requirements of a D_2O moderated, homogeneous, power reactor were estimated for a variety of initial loadings, for both batch and continuous methods of fuel removal. This study considered a 12-ft. spherical reactor, temperature 250°C, 500 Mw thermal power, 125 Mw electrical power capability, 0.8 load factor, and 4%/year inventory charges for U and D_2O. The fuel shipping-and-processing charges were assumed to be $1/gm of fissionable fuel for the "batch" processed reactors, and $0.37/gm for the "continuous" processed reactors. Under these conditions, the minimum fuel costs associated with a 10-year "batch" operating period were about 1.8 or 3.1 mills/kw-hr, if highly enriched U cost $15/gm or $30/gm, respectively. The analogous costs for the "continuous" processed reactor were about 1.6 and 2.6 mills/kw-hr, respectively. For these cases, the optimum U concentration was about 500 gm/liter. If fuel processing costs were $3.70/gm of fissionable fuel, the fuel costs for the "optimum" batch operated reactors would not be significantly changed. However, the fuel costs for the continuously processed reactor would now be about 2.1 or 3.2 mills/kw-hr based on $15/gm or $30/gm, respectively, for highly enriched U. (auth)

5015 CF-57-2-98
Oak Ridge National Lab., Tenn.
CALCULATION OF WALL-SCATTERED GAMMA RADIATION ESCAPING THROUGH A SHIELD OPENING — APPLICATION TO THE HRT. H. C. Claiborne and T. B. Fowler. Feb. 19, 1957. 27p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A simplified method was developed for calculating wall-scattered gamma radiation escaping through a shield opening. The method was applied to the HRT and the results showed that next to the line of sight contribution, scattering off the wall of the shield opening was the main contribution to the dose at the rear edge of the shield. Design chargs were prepared that give the dose as a function of the gamma source locations with the reactor cell. (auth)

5016 CRE-678
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
SOME REACTIVITY EFFECTS OF IRRADIATION IN NRU. C. D. McKay. Jan. 29, 1957. 57p. (AECL-405).

Reactivity effects in NRU of U^{235} burnup, the production and burnup of Pu^{239}, and the production, burnup, and decay of fission product Xe^{135} and Sm^{149} are considered, using an equivalent one group homogeneous model. Based on an effective migration area of 265 cm^2 it was estimated that at 200 Mw pile power the equilibrium Xe loading is 33.1 ± 1.8 mk, the time to poison out with a 16 mk override is 29 ± 4 min, and the duration of a poison shutdown is 38 ± 8 hours. It is estimated that the combined U^{235}, Pu^{239}, and Sm^{149} effects will result in an initial drop in reactivity for the first seven days of operation of about 8 ± 1 mk followed by a rise of about 0.5 ± 0.07 mk per day for a limited time. It was found that the Sm^{149} and Pu^{239} transients effectively cancel one another except for the case when long operation at power is followed by a long shut-down in which case a rise in reactivity to a maximum of 4.5 mk two days after the start-up is predicted for 200 Mw pile power operation. Similar calculations were performed for pile powers of 100 and 300 Mw and similar results were obtained. The "Effective Uniform Flux" approximation was compared in the case of the Sm^{149} problem with a more exact method and found to be quite adequate. (auth)

5017 CRIO-684
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
A DESCRIPTION OF CHALK RIVER EXPERIENCE WITH HEAVY WATER REACTOR VESSELS. D. D. Stewart. Jan. 1957. 40p. (AECL-402).

Chalk River experience with NRX "calandria" reactor vessels is summarized. The original calandria is de-

scribed and compared with the second one as to materials, fabrication, testing, and modifications. Proposed changes for the spare calandria are discussed. (T.R.H.)

5018 CRR-644-5

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

PROCEEDINGS OF THE TRIPARTITE REACTOR CORE CONFERENCE, HELD AT CHALK RIVER, ONTARIO, JANUARY 9–12, 1956. PART V. LONG IRRADIATION-REACTIVITY EFFECTS. J. W. Greenwood and J. E. Woolston, eds. Dec. 1956. 123p.

Experimental data and calculations on long-term reactivity changes in slugs are compared. The reactivities of U samples irradiated in NRX were measured in CP-2 by the danger coefficient technique. Resultant data are included. Papers are also included on the preparation of study specimens from NRX rod 683 and on the radial distribution of Pu isotopes and Cs^{137} in this rod. An interpretation of the experimental results on the rod is also given. A survey of fission product accumulation and poisoning in reactor fuels at Chalk River was completed, and results are included. Papers are also presented on analog computer methods of studying multiregion reactors and on the material balance in reactors with recycled fuel. (B.J.H.)

5019 HW-40778

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

A RECHARGEABLE PRESSURIZED FUEL ELEMENT IRRADIATION FACILITY. D. C. Kaulitz and T. W. Evans. Jan. 18, 1957. 14p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

A design for the in-reactor portion of a fuel element testing facility is described. By use of the "basket" principle, as developed for the MTR, and a special "quick-disconnect" coupler one can quickly and easily charge, discharge and recharge specimens in a pressurized facility. The facility is inherently safe and easy to operate and it permits easy removal of deformed specimens with minimum damage to the specimens. (auth)

5020 IDO-16255

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

MEASUREMENTS OF MTR-IRRADIATED THORIUM SLUGS IN THE REACTIVITY MEASUREMENT FACILITY. E. Fast and D. R. DeBoisblanc. Mar. 19, 1956. Decl. July 26, 1956. 15p. Contract AT(10-1)-205. $0.20(OTS).

This report describes measurements made in the Reactivity Measurement Facility at the MTR on a group of solid thorium, aluminum-jacketed, slugs which have been irradiated in the MTR for varying exposures. The object of this work was to develop a method for nondestructively assaying the U^{233} content of these slugs, so that further MTR exposure would be possible. Measurements carried out on nineteen slugs irradiated under the RD-1 program included reactivity measurements in RMF, and delayed neutron activation using the RMF as a neutron source. Correlations between the calculated nvt exposures and reactivity were not very good, but the relationship between relative delayed neutron activation in equal flux and reactivity perturbations is linear within the experimental accuracy of the measurements. Selected slugs have been sent to Argonne National Laboratory where they will be dissolved and quantitative uranium chemistry performed. With these analyses normalization of the data in this report will be possible. (auth)

5021 KAPL-M-SMS-46

Knolls Atomic Power Lab., Schenectady, N. Y.

S3G/S4G STATUS REPORT ON TESTS OF HIGH TEMPERATURE PURIFICATION MEDIA. A. A. Sugalski. Dec. 14, 1956. 55p. Contract W-31-109-Eng-52. $12.30 (ph OTS); $4.50(mf OTS).

Tests of various materials as purification media in high temperature high pressure water are described. None of the material tested demonstrated any significant ability to remove ions. Magnetite appeared to be the most stable material and exhibited an ability to maintain acceptable low Mn concentrations depending on the pH. It was found that the solubility of Fe and Mn is very sensitive to pH and that a pH greater than 7 is required to reduce the non-filterable Mn concentration to acceptable levels. The Na, Mg, and Ca concentrations in the effluent from the magnetite bed appeared to be about equal to the influent. There was some indication that Si and Al are leached from the magnetite; however, the concentration of Si decreased during the course of the run indicating that the degree of leaching is slight and may actually be negligible. Based on crud measurement with a hot crud filter it appears that the efficiency of crud removal was at least 83%. (auth)

5022 KAPL-M-WLR-3

Knolls Atomic Power Lab., Schenectady, N. Y.

APPROXIMATIONS TO REACTIVITY-BURNUP RELATIONSHIP OF LONG BURNING REACTORS. W. L. Robb. Dec. 1956. Decl. Mar. 4, 1957. 23p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

A study of methods for determining the time a reactor can operate on a given fuel loading has been undertaken, and the usefulness of the "initial conversion ratio" and the "initial reactivity slope" has been examined. The importance of certain parameters has been determined. (auth)

5023 KAPL-M-WLR-4

Knolls Atomic Power Lab., Schenectady, N. Y.

A STUDY OF NATURAL URANIUM FEED AND EQUILIBRIUM PLUTONIUM IN A WATER-COOLED AND MODERATED POWER REACTOR. W. L. Robb. Dec. 22, 1956. Decl. Mar. 7, 1957. 10p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A study was made to determine whether a light water cooled and moderated reactor could be operated with a fuel cycle using natural U feed and Pu recycle. Burnup calculations for a continuously fed, heterogeneous reactor indicate that, from a nuclear standpoint, such a reactor might be feasible and attractive. However, if an alloy or oxide fuel element is required, such a reactor would not retain its attractive features. (B.J.H.)

5024 KLX-10045

Vitro Labs., West Orange, N. J.

HOMOGENEOUS REACTOR FUEL REPROCESSING. Quarterly Progress Report [for] July 1–September 30, 1956. Vitro Job 1087. Harold F. Reichard, John D. McAdoo, Charles J. Anderson, Stanley J. Klach, Gloria K. Koenig, and Paul E. Smith. Oct. 31, 1956. Decl. Mar. 4, 1957. 26p. For Oak Ridge National Lab. Contract W-7405-eng-26, Subcontract 535. $0.35(OTS).

Further studies are reported on the behavior of I_2 in aqueous homogeneous reactor systems. Gas-stripping of I_2 from a circulating simulated HR fuel solution stream (O_2 overpressure) at 230°C and 850 to 960 psi was studied. Iodine vapor-liquid equilibria, I_2 adsorption from off-gases in the low-pressure recombiner catalyst bed, and the use of CuO as solid sorber in a high-pressure I_2 removal system were also investigated. (For preceding period see KLX-10034.) (T.R.H.)

5025 NAA-SR-1810

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

REACTOR SAFETY QUARTERLY PROGRESS REPORT [FOR] MAY–JULY 1956. N. C. Miller, ed. Mar. 15, 1957. 30p. Contract AT-11-1-GEN-8. $0.25(OTS).

Impact tests on the Mark III Hanford safety element indicate that the design is mechanically adequate and does not constitute a personnel hazard. The Mark IV design has been changed in several details to facilitate production and to decrease the thermal response time. The irradiation results of the NAA-109-2 assembly show that the NAA-109-3 will have to be redesigned to provide a decreased thermal resistance and thus reduce the fuse temperature. An external poison-storage device has been designed. The device consists of a pressurized cartridge stored outside of the reactor core, a connection to be thimble in the core, and a long trigger tube running from the cartridge into the thimble. The following alloys were investigated as possible liquid poisons for the power reactor safety element: Cd–Bi–In, Cd–Hg, and Cd–Bi–Pb–Sn. A partial investigation of the ternary Cd–Bi–In system was carried out to find the best compromise between the requirements of a low melting point and a high macroscopic thermal-neutron-capture cross section. A set of experiments was performed in which a metallic powder was blown into an annular region to test burst characteristics of the retaining diaphragm and dispersal patterns. (For preceding period see NAA-SR-1726.) (auth)

5026 NAA-SR-1811

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

THE KEWB PROGRAM QUARTERLY PROGRESS REPORT [FOR] JULY–SEPTEMBER 1956. Mar. 1, 1957. 33p. Contract AT-11-1-GEN-8. $0.30(OTS).

The reactor test facility for the KEWB program (Kinetic Experiments on Water Boilers) was made critical on July 13, 1956. Preliminary measurements have been made to determine the reactor characteristics. The response of the reactor to forced oscillations has been investigated with the pile oscillator technique and the data are presently being analyzed. Transient behavior of the reactor has been studied with reactivity releases up to 0.7 per cent. These experiments resulted in self-limited neutron bursts in which the peak reactor power reached 200 kilowatts for the maximum reactivity release of 0.7 per cent. The bursts were limited by an increase in the temperature of the reactor fuel along with a significant assist from the radiolytic gas evolution. Detailed analysis of the data is being conducted to develop quantitative conclusions on the dynamic behavior of the reactor. (auth)

5027 NARF-56-28T

Convair, Fort Worth, Tex.

THIN REFLECTOR EXPERIMENTS WITH THE GTR. M. A. Dewar and R. A. Lawrence. Dec. 30, 1956. 25p. Project 6(1-9964). Contract AF33(600)-32054. (MR-N-130).

Experiments performed with the GTA to determine some of the characteristics of an MRT-type reactor reflected only by a 3 in. layer of BeO are described. The results obtained indicated that a core reflected only by a thin layer of BeO has a smaller critical mass, greater fast neutron flux leakages, and more uniform specific power production, than a core reflected entirely by water. The changes in reactivity resulting from introducing irradiation samples or from adding water outside the thin BeO reflector, were found to be of sufficient magnitude to induce prompt criticality. (auth)

5028 TID-7525

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, NOVEMBER 8 AND 9, 1956. Jan. 15, 1957. 313p. (NAA-SR-1804). $1.50(OTS).

Papers on the Sodium Reactor Experiment include discussions of the design, physical progress, operations, component development and fabrication, fuel materials, and zirconium problems. Papers on the Organic Moderated Reactor Experiment include discussions of the design, construction progress, research, and economics. (B.J.H.)

5029 WAPD-C-188

Ionics, Inc., Cambridge, Mass.

DEVELOPMENT OF THE ION EXCHANGER FOR STR. Final Report [for] March 27, 1951 to December 1, 1952. J. A. Marinsky and W. D. Potter. Apr. 17, 1953. Changed from OFFICIAL USE ONLY Feb. 28, 1957. 83p. For [Westinghouse Electric Corp. Atomic Power Div.]. Contract AT-11-1-GEN-14, Subcontract 14-316. $13.80(ph OTS); $4.80(mf OTS).

Work performed toward the development of the ion-exchanger for STR is summarized. Material covered includes selection of resins for mixed bed demineralization, performance of mixed resin beds at low solute concentrations, graphical computation of demineralization efficiency, and the preparation and conversion for use of the individual resin components in the demineralization column. The extent of classification of the anion and the cation components of the mixed resin bed under vibratory motion and the effect of such classification upon demineralization performance is included. Results of studies on the thermal stability and radiation stability of representative commercial ion-exchange resins are given. (auth)

5030 WAPD-T-326(Del.)

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

FABRICATION OF ZIRCALOY CLAD FUEL PLATE ASSEMBLIES FOR PRESSURIZED WATER REACTORS. C. A. Meyers and E. D. Baugh. Apr. 1956. Decl. with deletions Feb. 28, 1957. 13p. Contract AT-11-1-GEN-14. $1.80(ph OTS); $1.80(mf OTS).

A brief description is given of the process intended for use in the fabrication of the PWR core seed. (B.J.H.)

5031 WAPD-TM-31

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

COMPARISON OF TWO METHODS FOR ANALYZING ACCIDENTAL POWER TRANSIENTS. B. H. Noordhoff, C. E. Foreman, and J. W. Haskins. Jan. 1957. Decl. Feb. 28, 1957. 36p. Contract AT-11-1-GEN-14. $6.30 (ph OTS); $3.00(mf OTS).

An analytical procedure for calculating the self-shutdown features associated with an exponential power excursion in a critical assembly is presented. The method combines the previously reported analyses of Golian and Sanford into a simplified calculational form. A specific calculation is included to illustrate the principal features of the general analysis. (auth)

5032 YAEC-7

Yankee Atomic Electric Co., Boston.

QUARTERLY PROGRESS REPORT FOR JUNE 6, 1956 TO SEPTEMBER 30, 1956. Oct. 30, 1956. 26p. Contract AT(30-3)-222. $4.80(ph OTS); $2.70(mf OTS).

The work performed in this period, June-September 1956, consists of: surveys of available information, conceptual studies and calculations of the reactor systems, preliminary laboratory experiments, and studies and calculations to establish performance of the core as it affects plant economics. The nuclear calculations include studies of: the basic reactor parameters, reactivity effects of temperature, burnup, fission product buildup, metal-to-water ratios, steady state and transient control requirements, radiation intensities, fuel geometry and enrichment. The nuclear work also included planning of criticality, and irradiation experiments and the analysis of resulting data and general nuclear consultation for other portions of the research and development program. Conceptual designs

and preliminary studies have been made on the main coolant and the primary loop auxiliary systems. This work is being continued to optimize the performance and economics of the reactor plant. Preliminary calculations were made on biological shielding requirements for normal plant operation and for the case when a rupture of the main coolant system is assumed to occur. Studies have been made to determine design requirements to maintain tolerable radioactivity levels of waste leaving the plant during normal plant operation. Various fuel handling schemes are also under study. (auth)

5033 YAEC-13(Rev. 1)

Westinghouse Electric Corp. Commercial Atomic Power, Pittsburgh.

YANKEE ATOMIC ELECTRIC COMPANY RESEARCH AND DEVELOPMENT PROGRAM. Quarterly Progress Report for September 30 to December 31, 1956. Jan. 22, 1957. 38p. For Yankee Atomic Electric Co., Boston. Contract AT(30-3)-222, Subcontract No. 1. $6.30(ph OTS); $3.00(mf OTS).

The progress to date consists of: surveys of literature and other available information, conceptual studies and calculations of the reactor, and the reactor components and systems, preliminary laboratory experiments, analytical studies to determine the performance and stability of the core and control systems, and preparation of preliminary designs, diagrams, reports, specifications and functional descriptions. (auth)

5034 AEC-tr-2831

DYNAMICS OF REACTOR POISONING BY XENON. C. P. Caillet and J. Carpentier. Translated by K. S. Bevis from J. Nuclear Energy 3, 49-63(1956). 19p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 11-2138. (L.M.T.)

5035

DESCRIPTION AND OPERATION OF TWO ORNL RESEARCH REACTORS–X-10 GRAPHITE REACTOR AND LITR. J. A. Cox (Oak Ridge National Lab., Tenn.). Am. Ceram. Soc. Bull. 36, 90-5(1957) March.

Two types of research reactors are operated at Oak Ridge National Laboratory. One is a graphite moderated, air-cooled, natural uranium reactor; the second is a water-cooled and moderated, enriched uranium reactor. The advantages and characteristics of each type are discussed and some of the problems encountered in their operation are described. (auth)

5036

SOME ENGINEERING PROBLEMS OF NUCLEAR POWER STATIONS. Claude D. Gibb. Nuclear Power 2, 85-90(1957) March.

5037

DATA PROCESSING FOR BURST SLUG SYSTEMS. D. D. Bowen. Nuclear Power 2, 91-5(1957) March.

A system is described for detecting burst slugs in gas-cooled power reactors. (W.L.H.)

5038

THE PWR NEARS COMPLETION. Nuclear Power 2, 96-7 (1957) March.

Construction of the Shippingport Reactor pressure vessel and a brief outline of the operation are given. (W.L.H.)

5039

PACKAGED PWRS TO BE BUILT IN UK. Nuclear Power 2, 104-6(1957) March.

Refer also to abstracts 4942 and 4968.

NUCLEAR TRANSFORMATION

5040 HW-47284

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

NEUTRON ENERGIES CALCULATED FOR $Be^9(d,n)B^{10}$ FOR DEUTERONS UP TO 2 MEV. J. De Pangher. Dec. 17, 1956. 56p. Contract W-31-109-Eng-52. $0.40(OTS).

From published values of the excitation energies of B^{10} the neutron energies for the reaction $Be^9(d,n)B^{10}$ have been calculated non-relativistically for deuteron energies up to 2 Mev. A brief discussion of the intensities of the neutrons and the sources of background is also presented. (auth)

5041

STUDY OF THE REACTIONS $Se^{82}(\gamma,n)Se^{81}$ AND $Se^{82}(\gamma,n)Se^{81*}$. E. Silva and J. Goldemberg. Anais acad. brasil. cienc. 28, 275-80(1956). (In Portuguese)

5042

ON THE CALCULATION OF THE EFFECTIVE CROSS SECTIONS FOR PHOTONUCLEAR REACTIONS INDUCED BY BREMSSTRAHLUNG RADIATION. Georges Boulegue. Compt. rend. 244, 881-4(1957) Feb. 11. (In French)

5043

THE MULTIPOLARITY OF γ-RAY ABSORPTION IN ^{12}C $(\gamma,3\alpha)$ REACTION PRODUCED BY (Li,p)γ-RAYS. J. Muto, E. Takekoshi, T. Nakamura, A. Imamura, and Y. Tsuneoka (Univ. of Kyoto). J. Phys. Soc. Japan 12, 109-13(1957) Feb.

The mechanism of the $C^{12}(\gamma,3\alpha)$ reaction for (Li,p)γ rays has been estimated from a study of 576 stars in nuclear emulsions. By the analysis of the angular distributions and correlation of the α particles, the multipolarity of the absorption process of (Li,p)γ rays by the C^{12} nucleus can be explained by the mixture of two sorts of interaction E1 and E2. This result is consistent with Goward and Wiklin' conclusion, but experimental data of the angular distribution of the first α particles show significant forward asymmetry contrary to their backward asymmetry. (auth)

5044

MEASUREMENT OF CIRCULARLY POLARIZED GAMMA-RADIATION FOLLOWING POLARIZED NEUTRON CAPTURE Georg Trumpy (Joint Establishment for Nuclear Energy Research, Lillestrom, Norway). Nuclear Phys. 2, 664-79 (1957) Feb.

Circular polarization of the γ rays emitted from nuclei capturing polarized neutrons was studied by means of the dependence of the Compton cross section upon the relative spin direction of the photon and the electron. Thermal neutrons polarized by transmission through magnetized iron fell on the (n,γ) target, and the γ rays were detected by two NaI(Tl) crystals after passing through analyzers of iron magnetized in the direction of transmission. Measurements were carried out with the strongest neutron capture γ rays from S, Ca, Ti, Cr, Fe, Ni, Zn and W. From the results, some of the spin values of these nuclei could be derived. The degree of circular polarization was in accordance with theory. (auth)

5045

ISOTOPIC SPIN SELECTION RULES. XII. THE MIRROR REACTIONS $^6Li(d,n)^7Be$ AND $^6Li(d,p)^7Li$. D. H. Wilkinson (Brookhaven National Lab., Upton, N. Y.). Phil. Mag. (8) 2, 83-93(1957) Jan.

It is remarked that the mirror reactions, $Li^6(d,n)Be^7$ and $Li^6(d,p)Li^7$ leading to the first excited states of the mirror nuclei form an excellent testing place for the prediction following the assumption of charge-independence that such mirror reactions have equal intrinsic probability. This is because the reactions are almost non-resonant which makes for the good operation of the isotopic spin rules and because the protons are emitted well above the Coulomb barrier which makes the interpretation of the experimental neutron to proton branching ratio rather simple. It is also remarked that the experiment may be performed without observing the neutrons and protons by using the gamma rays from the excited states to label the two transitions; all higher excited states are unstable to heavy particle

emission and so do not yield gamma rays. The branching ratio is determined at 31 deuteron energies between 200 kev and 1.8 Mev. Over the whole range it agrees to within 15% with that expected from charge independence but there are signs of a resonance like maximum to the ratio at about 450 kev which departure from the isotopic spin rule is in keeping with the behavior of the ^6Li + d total cross sections. (auth)

5046

AN INVESTIGATION OF NEUTRON GROUPS FROM THE REACTION $^{10}B(d,n)^{11}C$ AT 7.0 MEV DEUTERON ENERGY. A. Graue and B. Trumpy (Univ. of Bergen, Norway). Phil. Mag. (8) 2, 138-40(1957) Jan.

Energy spectra and angular distributions of the neutrons from the reaction $B^{10}(d,n)C^{11}$ have been measured at 7.007 ± 0.01 Mev bombarding energy using the photographic plate technique. Levels in C^{11} were found at 8.5, 9.0, 10.0, 10.5 and 10.85 Mev excitation energy. (auth)

5047

GROUND-STATE TRANSITIONS IN THE REACTION $^{10}B(n,t)^8Be$. E. W. Titterton and T. A. Brinkley (Australian National Univ., Canberra). Nature 179, 368-9(1957) Feb. 16.

Neutrons at 14.1 Mev were used to bombard Ilford E1 emulsions 200 μ thick and loaded with the normal isotopic mixture of boric acid. Nine stars were observed which can be assigned to the reaction $B^{10}(n,t)Be^8$. The experiment indicates that, contrary to previous results, this reaction does occur at 14.1 Mev and that the cross section for transitions to the ground state is about 3% of the total cross section of B^{10} $(n,t2\alpha)$. (B.J.H.)

5048

RESOLVED NEUTRONS FROM THE Be(α,n) REACTION. J. R. Risser, J. E. Price, and C. M. Class (Rice Inst., Houston, Texas). Phys. Rev. 105, 1288-93(1957) Feb. 15.

Angular distributions and 0° excitation curves have been taken of resolved ground-state and first-excited-state neutron groups from the reactions $Be^9(\alpha,n)C^{12}$ (Q = 5.71 Mev) and $Be^9(\alpha,n)C^{12*}$ (Q = 1.28 Mev). For the ground-state neutron group, angular distributions were taken at bombarding energies from 2 to 5 Mev, and a 0° excitation curve from 1.7 to 4.8 Mev. For the neutron group to the first excited state of C^{12}, angular distributions were taken in the range 4 to 5 Mev, and a 0° excitation curve from 3.1 to 4.8 Mev. Attempts were made to fit the ground-state neutron angular distributions above 4 Mev using compound-nucleus theory. (auth)

5049

RELATIVE YIELDS OF NUCLEAR ISOMERS OF Br^{80} PRODUCED BY A (γ,n) REACTION. A. M. King and A. F. Voigt (Iowa State Coll., Ames). Phys. Rev. 105, 1310-11 (1957) Feb. 15.

The yield ratio, $Br^{81}(\gamma,n)Br^{80}/Br^{81}(\gamma,n)Br^{80m}$, was determined at several energies between 15 Mev and 70 Mev, using bremsstrahlung produced by the Iowa State 70-Mev synchrotron. It was concluded that the yield ratio does not change significantly above 25 Mev, and, consequently, that the corresponding cross section ratio is also constant. (auth)

5050

PHOTOPRODUCTION OF PION PAIRS IN HYDROGEN. R. M. Friedman and K. M. Crowe (Stanford Univ., Calif.). Phys. Rev. 105, 1369-77(1957) Feb. 15.

The photoproduction of pion pairs ($\pi^- + \pi^+$) has been measured by observing a π^- signal from liquid hydrogen bombarded with bremsstrahlung of energies up to 600 Mev. The excitation function and π^- energy spectrum measured at 60° in the laboratory system agree qualitatively with the calculations of Cutkowsky and Zachariasen. The major part of the process corresponds to the emission of the π^+ in the resonant P state and the π^- in an S state. The net increase in the π^+ yield due to $(\pi^- + \pi^+)$ and $(\pi^0 + \pi^+)$ pairs is also observed. (auth)

PARTICLE ACCELERATORS

5051 NP-6221

Illinois. Univ., Urbana.

THE RADIAL STABILITY OF ORBITS IN A SPIRAL RIDGE CYCLOTRON. Technical Report No. 1. Peter Stähelin. [1956?]. 34p. Contract Nonr 1834(05).

In a low-energy cyclotron the frequency of radial oscillation is nearly equal to the orbital frequency, establishing an approximate resonance between the radial oscillations and the periodic structure of the magnetic field of the spiral ridges. The influence of this resonance on the amplitude of radial oscillations is investigated, and the effects of this influence are discussed. (D.E.B.)

5052 NP-6222

Illinois. Univ., Urbana.

INVESTIGATION OF THE FIELD MODULATION PRODUCED BY FLAT SPIRAL SHIMS IN A CYCLOTRON MAGNET. Technical Report No. 2. V. Bluemel, J. B. Carroll, and P. Stähelin. [1956]. 27p. Contract Nonr-1834(05).

The achievement of desired field modulation with mechanically simple iron shims on flat pole faces was investigated, and shim dimensions for the University of Illinois cyclotron were determined. (D.E.B.)

5053 OSR-TN-57-7

Illinois. Univ., Urbana. Electrical Engineering Research Lab.

THEORETICAL AND EXPERIMENTAL EVALUATION OF THE REBATRON—A RELATIVISTIC ELECTRON BUNCHING ACCELERATOR. Irving Kaufman. Dec. 1, 1956. 330p. Project 47501. Contract AF18(603)-62. (AD-115039).

The development of sources of appreciable RF power in the 1 mm to 0.1 mm wavelength range of the electromagnetic spectrum has yet to be accomplished. A very promising approach to the problem is the coherent interaction with a circuit, or the direct radiation, of a tightly bunched, megavolt electron beam. Work on a device for producing such a beam has resulted in a compact relativistic electron bunching accelerator, designated the REBATRON. One form of rebatron consists of an electron gun, followed by two 10-cm cavities that are powered by a megawatt source. Calculations have shown that it may be possible to achieve very short, high density electron bunches from this rebatron, corresponding to strong harmonic content of up to the two-thousandth harmonic of this 3000 mc/s source. A direct measurement to verify the degree of bunching, involving the measurement of pulse times of 10^{-13} seconds, has obvious complications. Fortunately, a change in one of the rebatron parameters that influences the bunching is accompanied by a change in the output electron momentum spectrum, so that the rebatron performance may be evaluated by correlation of computed with experimentally determined momentum spectra. Such a comparison between theoretical and experimental momentum spectra has yielded very satisfactory results and has resulted in the conclusion that, to a high degree, this rebatron operates as predicted. Beam coupling experiments at 72.2 kmc/s (the 26th harmonic) have further confirmed this conclusion. This report describes the rebatron, calculations of its theoretical behavior and their results, the experimental methods used in the attempts to verify the computed results, and the experimental results obtained. (auth)

5054
ENERGY MODULATION FOR PARTICLE ACCELERATORS. L. Cranberg, W. P. Aiello, R. K. Beauchamp, H. J. Lang, and J. S. Levin (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 28, 84-8(1957) Feb.

The energy of an electrostatic accelerator is modulated over a range of 50 kev by applying an alternating potential of 50-kv amplitude to an insulated target at a frequency of 10 cps. A sample of the modulating voltage and the signals from a nuclear detector are fed to a so-called "function sampler," which furnishes an output pulse whose height is proportional to the instantaneous value of the target voltage. Analysis of the pulse-height spectrum by means of a 100-channel analyzer then affords a presentation of the spectrum of nuclear events as a function of accelerator energy over a 50-kev range, each channel of the analyzer corresponding to an energy width of 500 ev. Advantages of this system are discussed for high resolution work with an electrostatic accelerator. (auth)

RADIATION ABSORPTION AND SCATTERING

5055 AD-59956
Massachusetts Inst. of Tech., Cambridge.
A VARIATIONAL TREATMENT OF ATOMIC SCATTERING. Technical Report No. 4 [on] MACHINE METHODS OF COMPUTATION AND NUMERICAL ANALYSIS. Maurice C. Newstein. Feb. 1955. 90p. Project DIC-6915. Contract N5ori60.

5056 NARF-57-1T
Convair, Fort Worth, Tex.
SPATIAL DISTRIBUTION OF NEUTRONS BEYOND A STRAIGHT CYLINDRICAL DUCT THROUGH A SHIELD. J. W. Neuberger and R. L. Johnston. Jan. 15, 1957. 30p. Project 6(1-9964). Contract AF33(600)-32054. (MR-N-137).

In the design of experiments using neutrons which issue from a reactor beam hole, it is important to know the spatial distribution of these neutrons beyond the biological shield. A method for obtaining this distribution suitable for high-speed electronic computation is described together with results obtained on Convair-Fort Worth's IBM-704. In this method, the intensity at the field point is assumed to consist of the unscattered neutron beam and a scattered component arising from internal scattering in a straight cylindrical duct through the shield. The problem is discussed using a general source distribution function and then specialized to the case of a plane cosine source distribution for particular collimating systems. (auth)

5057 UCRL-3656
California. Univ., Berkeley. Radiation Lab.
DIRECTION OF POLARIZATION PRODUCED BY QUASI-ELASTIC SCATTERING OF 315-MEV PROTONS. Hugh Bradner and William Isbell. Jan. 30, 1957. 15p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

Protons scattered quasi-elastically with energy 315 Mev at 13° from a beryllium target in the Berkeley synchrocyclotron were brought out of the machine, slowed by absorbers, and scattered in helium at 765 psi absolute pressure. Scatters at angles of 90° ± 22.5° were detected in nuclear emulsions. Observed asymmetries in left versus right scattering of protons with energies below 14 Mev were used, in conjunction with phase shifts from p-He scattering data, to compute the direction of spin polarization. Spin up from left scatter was found, in agreement with the predictions of spin-orbit coupling theory, and with the findings of other experimenters. (auth)

5058
ELASTIC SCATTERING OF 20-MEV PROTONS BY OXYGEN AND NITROGEN. R. H. Chow and Byron T. Wright (Univ. of California, Los Angeles). Can. J. Phys. 35, 184-94(1957) Feb.

The absolute angular distributions for 20-Mev protons elastically scattered by O^{16} and N^{14} were determined using the external beam of the frequency-modulated cyclotron at the University of California, Los Angeles. The distributions for the two elements were found to be similar except for the appearance of a more pronounced first minimum in the O^{16} distribution. The locations of the maxima and minima seem to indicate that simple diffraction effect is responsible for their presence. The cross sections range from about 1 b per sterad. to 4 mb per sterad. between 15 and 165° in the laboratory system. The standard deviations due to statistics range from 1½ to 10%. (auth)

5059
INCOHERENT NEUTRON SCATTERING BY POLYCRYSTALS. G. Placzek (Inst. for Advanced Study, Princeton, N. J.). Phys. Rev. 105, 1240-1(1957) Feb. 15.

General expressions are given for the first terms in the expansion in powers of the neutron to nuclear mass ratio of the total cross section for incoherent scattering of neutrons by polycrystals. Special limiting cases of these expressions had been published earlier. (auth)

5060
ELECTRON CAPTURE BY PROTONS PASSING THROUGH HYDROGEN. Trilochan Pradhan (Univ. of Chicago, Ill.). Phys. Rev. 105, 1250-9(1957) Feb. 15.

A formal treatment of the capture problem is presented and a suitable approximation scheme valid for fast collisions is developed. The approximation consists of: (1) using a suitable perturbed initial wave function instead of the unperturbed initial wave function used in the Born approximation, (2) neglecting the contribution of what we call two-step capture processes, and (3) in an impulse approximation fashion, neglecting the effect of the binding of the electron in the atom in the initial state "during" the collision. All the above three approximations result from an attempt to express the transition matrix for capture in terms of two-body operators. The improved wave function is orthogonal to the final wave function in the limit of infinitely heavy incident ion, unlike the Born approximation wave function. Consequently the (incident ion)-(nucleus) interaction has zero matrix element for transition from the initial state to the final state. Only the (incident ion)-(electron) interaction contributes to the capture cross section in this approximation. Good agreement with experiment is obtained in the particular case of protons picking up electrons from hydrogen gas for proton energies above 25 kev. (auth)

5061
MEASUREMENT OF THE RADIATIVE CORRECTION TO ELECTRON-PROTON SCATTERING BY OBSERVATION OF THE ABSOLUTE CROSS SECTION. George W. Tautfest and W. K. H. Panofsky (Stanford Univ., Calif.). Phys. Rev. 105, 1356-68(1957) Feb. 15.

The scattering of 139.5-Mev electrons in hydrogen gas at one-atmosphere pressure has been investigated using photographic emulsions. The beam of electrons from the Stanford Mark III linear accelerator, collimated to a diameter of 1/16 in., passed through the gas and was collected in a lead Faraday cup. Ilford C-2 emulsions, 50 μ thick, which were arranged symmetrically about the beam, detected the recoil protons. Measurements of the recoil angle γ and the range in the emulsion were made on the proton tracks. Only those events were accepted whose measured range and angle correlated within ± 2.33 standard deviations of the distribution about the elastic kinematic range-angle curve calculated from the multiple scattering in the emulsion and the uncertainty in angle measurement. A total of 2350 tracks has been tabulated in the angular interval $54° \leq \gamma \leq 78°$ giving a statistical

error matching the systematic errors in plate geometry, beam integration, and track measurement. The results are compared with the Mott cross section integrated over the interval. The theoretical cross section was corrected for (a) proton recoil, (b) the proton magnetic moment, (c) the finite size of the proton's charge and magnetic moment, (d) the radiative correction, including the effect on the cross section of emission of real photons contributing to the observed recoil protons. The result is $\sigma_{exp}/\sigma_{theor} = 0.988 \pm 0.021$ (probable error), using a proton radius of 7.7×10^{-14} cm, and including a 2.74% radiative correction; the result is not sensitive to the choice of proton radius. (auth)

5062

HIGHER ORDER RADIATIVE CORRECTIONS TO ELECTRON SCATTERING. D. R. Yennie (Stanford Univ., Calif.) and H. Suura (Inst. for Advanced Study, Princeton, N. J.). Phys. Rev. 105, 1378-82(1957) Feb. 15.

The higher order radiative corrections are examined in the infrared region, and Schwinger's conjecture regarding the functional dependence of these corrections on the energy resolution is proved. (auth)

5063

INELASTIC COLLISIONS BETWEEN HEAVY PARTICLES. V. ELECTRON LOSS FOR FAST He^+ IONS PASSING THROUGH ATOMIC HYDROGEN, AND IONIZATION OF HYDROGEN ATOMS BY FAST He^+ IONS. T. J. M. Boyd, B. L. Moiseiwitsch, and A. L. Stewart (Queen's Univ. of Belfast). Proc. Phys. Soc. (London) A70, 110-16(1957) Feb.

Born's approximation is used to calculate the cross sections for the processes $He^+(1s) + H(1s) \rightarrow He^{2+} + e + H(1s, 2sp, 3spd \text{ or } C)$, where C represents the continuum. The effect of double transitions is found to be important for impact energies greater than about 300 kev. The agreement between the calculated electron loss cross section and the experimental data of Allison, Cuevas and Murphy for energies of the incident He^+ ion lying between 100 and 450 kev is quite good except at the limits of the experimental energy range. The ratio of the electron loss cross section to the electron capture cross section is also computed and compared with experiment. Again, the agreement is quite good. In addition, Born's approximation is employed to calculate the cross section for the process $He^+(1s) + H(1s) \rightarrow He^+(1s) + H^+ + e$, which provides the dominant contribution to the total ionization cross section. (auth)

5064

INELASTIC COLLISIONS BETWEEN HEAVY PARTICLES. VI. THE $2s^3S$-2p AND $3p^3P$ EXCITATIONS OF FAST He ATOMS BY H AND Ne ATOMS. J. Adler and B. L. Moiseiwitsch (Queen's Univ. of Belfast). Proc. Phys. Soc. (London) A70, 117-22(1957) Feb.

Born's approximation is used to calculate the cross sections for the processes $He(2s^3S) + Ne(2p^6\,^1S) \rightarrow He(2p \text{ or } 3p\,^3P) + Ne(2p^6\,^1S)$ and $He(2s^3S) + H(1s) \rightarrow He(2p \text{ or } 3p\,^3P) + H(1s \text{ or } 2sp)$. In addition, the total cross sections at high energies for the $2s\,^3S - 2p$ or $3p\,^3P$ excitations of He atoms by Ne and H atoms are obtained. (auth)

5065

POLARIZATION OF PROTONS SCATTERED FROM CARBON AT 970 MeV. C. J. Batty and S. J. Goldsack (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) A70, 165-6(1957) Feb.

Preliminary experiments on the polarization of 970-Mev protons scattered from the Birmingham proton synchrotron are reported. The internal synchrotron beam was scattered from a C target, and the scattered tracks were recorded in Ilford G5 plates. The resultant polarization is shown as a function of angle. (B.J.H.)

Refer also to abstracts 4952, 4994, and 5049.

RADIATION EFFECTS

5066 KAPL-1698

Knolls Atomic Power Lab., Schenectady, N. Y.

A SUMMARY OF X-RAY STUDIES OF IRRADIATION EFFECTS. C. W. Tucker, Jr. and P. Senio. Jan. 24, 1957. 18p. Contract W-31-109-Eng-52. $0.20(OTS).

A summary is given of an x-ray program for the study of irradiation effects on ionic, covalent, and metallic crystals. X-ray effects caused by point defects and long range defects are discussed. Examples of metallic, covalent, and ionic crystals showing these effects are discussed. The most promising areas for future work are given. (auth)

5067

NATURE OF RADIATION DAMAGE IN CRYSTALLINE SOLIDS. J. H. Crawford, Jr. (Oak Ridge National Lab., Tenn.). Am Ceram. Soc. Bull. 36, 95-8(1957) March.

The nature of radiation damage in nonmetallic systems is briefly reviewed. The mechanisms of interaction of energetic nuclear particles with atoms in solids are briefly discussed and the resultant lattice defects are enumerated. The effect of fast particle bombardment on physical properties of nonmetals is illustrated by means of specific examples using typical systems such as silicon dioxide and potassium chloride. Factors contributing to radiation sensitivity and means of mitigating adverse effects are discussed. (auth)

5068

NEUTRON SPECIFIC COLOR CENTER IN FUSED SILICA AND AN IMPURITY BAND OF IDENTICAL WAVELENGTH. Alvin J. Cohen (Mellon Inst., Pittsburgh). Phys. Rev. 105, 1151-5(1957) Feb. 15.

A color center at 242 mμ is produced in certain specimens of fused silica only by pile irradiation and not by x ray, high energy electron, or proton bombardment. It is removed by heating to 700°C and can be reintroduced only by pile irradiation. The significance of an impurity absorption band already reported in fused silica at the same wavelength is discussed. An intense band appears in rather pure optical-quality fused germanium dioxide centered at 245 mμ and is due to the same reduced germanium species that causes the 242-mμ impurity band in fused silica. (auth)

RADIOACTIVITY

5069 ISC-679

Ames Lab., Ames, Iowa.

DECAY SCHEMES OF Cl^{34} AND Sc^{47}. R. T. Nichols and E. N. Jensen. Dec. 1954. 65p. Contract W-7405-eng-26.

Cl^{34} was obtained from a γ,n reaction upon ordinary chlorine. Three positron components were separated from the beta spectrum of Cl^{34} obtained from an intermediate-image spectrometer. Coincidence beta spectra obtained with the use of the same instrument gave additional energy determinations for the two lower-energy beta groups as well as indicating the time relationships between the beta rays and the gamma rays in Cl^{34}. The low-energy gamma ray in Cl^{34} was studied by means of its internal conversion peak. The 1.1-Mev and 2.1-Mev gamma rays were measured from photographs of the Cl^{34} gamma scintillation pulse distribution. The decay scheme indicated from the results was completed with the use of beta log ft values and gamma lifetime values for the spin and parity assignments given to the nuclear energy levels. This proposed decay scheme is shown. The Sc^{47} sources were prepared from a γ,p reaction upon ordinary titanium. The Sc^{44} positron activity was eliminated from the beta spectrum of

Sc^{47} by use of a charge-discriminating baffle. Low counting rates and high source thickness lowered the precision of the measurements but two beta groups were separated by means of their Kurie plots with the energy of the lower-energy component agreeing very well with the energy measured for the same component as it was obtained from a coincidence beta spectrum. The energy difference between the two beta groups agreed well with the energy for the accompanying gamma ray which was measured by the scintillation spectrometer. A decay scheme was set up from these results using nuclear shell theory for orbital assignments. This proposed decay scheme is self-consistent although it disagrees with the results of the three other investigators cited from recent literature. (auth)

5070

DECAY SCHEME FOR Zr^{97} AND Nb^{97}. N. N. Delyagin, A. A. Sorokin, N. V. Forafontov, and V. S. Shpinel (Moscow State Univ.). Nuclear Phys. 2, 687-705(1957) Feb.

The decay scheme for Zr^{97} and Nb^{97} has been investigated with a double-lens β spectrometer connected in coincidence with a scintillation γ spectrometer and also with a coincidence scintillation γ spectrometer. A partial β spectrum has been separated which has an upper limit $E_\beta = 0.45$ Mev and can be assigned to Zr^{97}. In addition to known intense γ lines from Zr^{97}, weak γ lines—1.35 (3 to 5%); 1.62 ($\approx$1.5%); 2.2 (1 to 2%); 2.58 ($\leq$ 1%) Mev—have been detected. The existence of cascade γ radiation has been established and a tentative decay scheme is proposed. (auth)

5071

THE NATURAL RADIOACTIVITY OF LANTHANUM. R. N. Glover and D. E. Watt (The Univ., Glasgow). Phil. Mag. (8) 2, 49-56(1957) Jan.

The decay of La^{138}, the middle member of a naturally occurring isobaric triplet, is studied by means of heavily shielded scintillation and proportional tube spectrometers. The existence of only two of three γ rays reported by earlier investigators is confirmed, their energies being (0.81 ± 0.01) and (1.44 ± 0.02) Mev. No annihilation quanta were observed. Coincidence studies show that these γ rays are not in cascade, and that the 1.44-Mev transition belongs to the electron capture branch. A previously unobserved β ray spectrum with maximum energy (205 ± 10) kev is detected. The experimental log ft value of 19.0 and known spin change $\Delta I = 3$ indicate a 3rd forbidden transition. No evidence of a reported 1.0-Mev β transition is found. A new decay scheme is proposed and agrees with the results of independent investigators on the β^- and β^+ activity of Cs^{138} and Pr^{138}, respectively. The partial half life of the electron capture branch is found to be $(1.64 \pm 0.06) \times 10^{11}$ yr, and of the β branch $(4.1 \pm 0.7) \times 10^{11}$ yr and $(3.5 \pm 0.3) \times 10^{11}$ yr measured by direct counting of the β rays and by calculation of the total counts due to the 0.81-Mev γ ray, respectively. 70% of the total disintegrations are estimated to proceed by electron capture and 30% by β emission. (auth)

THEORETICAL PHYSICS

5072 UCRL-3636

California. Univ., Berkeley. Radiation Lab.

RELATIVISTIC ELECTRODYNAMICS OF ROTATING MEDIA. John Ise, Jr. Jan. 9, 1957. 24p. Contract W-7405-eng-48. $0.25(OTS).

The electromagnetic field equations in rotating systems are derived from the generally covariant tensor formulation and used to calculate the emf in rotating material media. The electrostatic field outside a rotating bar magnet is shown to be zero, neglecting end effects. The emf in rotating magnetic insulators is also derived and compared to the value derived from the Minkowski equations for uniformly moving media. Some extra terms, representing current and charge density appear in the ordinary vector formulation of the field equations in rotating coordinates, and the physical significance of these quantities is discussed. (auth)

5073

ON THE INFORMATION ABOUT β-INTERACTION AND NUCLEAR LEVELS DERIVED FROM THE POLARIZATION OF X-RAY QUANTA. A. Z. Dolginov (USSR Academy of Sciences, Leningrad). Nuclear Phys. 2, 723-35(1957) Feb.

It is shown that the sign and magnitude of the ratio of the scalar and tensor β interaction constants can be determined by observing the polarization of x-ray quanta emitted when the vacancy in the atomic shell is filled after allowed K capture. It is suggested for this purpose that the correlation between circular polarization of the x-ray quanta and the direction of predominant orientation of nuclear spins in an external field be studied. If there is no external field but the nucleus undergoes a radiative transition after K capture it should be feasible to investigate the correlation between the circular polarizations of the x-ray and nuclear quanta. If the atomic shell vacancy is due to a conversion transition, information on nuclear level moments and parities can be obtained by observing polarization correlation of the x-ray quanta. The polarization of β electrons and γ quanta in a complex cascade transition is also considered. (auth)

5074

THEORY OF p-WAVE PION-NUCLEON INTERACTION. S. Fubini and W. E. Thirring. Phys. Rev. 105, 1382-7(1957) Feb. 15.

Exact relations are used to determine parameters like the cutoff and the unrenormalized coupling constant which are consistent with the low-energy scattering data. Under general assumptions about the Hamiltonian some inequalities are derived. For the Chew model those parameters can be determined with great accuracy. If one uses a Yukawa source function, the cutoff must be 4.7 and $f_0^c = 0.22$ in order not to be inconsistent with those relations. (auth)

5075

MULTIPLE SCATTERING BY QUANTUM-MECHANICAL SYSTEMS. K. M. Watson (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 105, 1388-98(1957) Feb. 15.

A simple description is given of the quantum-mechanical theory of multiple scattering. The separation of the scattered wave into "coherent" and "incoherent" parts is discussed in greater generality than has been done previously. Applications to transport theory are described. Specific calculations are made of the refractive index of a medium which is "polarized" by the scattered particle (Lorentz-Lorenz formula) and also of a medium which has correlated structure (critical opalescence). Other applications are given. (auth)

5076

PAIR PRODUCTION OF s-WAVE PI MESONS. Adam M. Bincer (Massachusetts Inst. of Tech., Cambridge, Mass.). Phys. Rev. 105, 1399-1406(1957) Feb. 15.

A theory for pair production of s-wave π mesons is constructed along the lines of the Chew-Low-Wick formalism. A bilinear s-wave interaction of the form as used by Drell, Friedman, and Zachariasen is added to the p-wave interaction as used by Chew and Low. It is shown that if the s-wave interaction is limited to the λ_0 term (scalar pair theory) the cross section for pair production of s waves vanishes. By using both the λ_0 and λ terms, the cross section for inelastic scattering of a p-wave meson into two s-wave mesons, near threshold (total energy of the produced mesons $\leq$ 350 Mev), per unit energy of one of the produced mesons is determined to be of the order of millimicrobarns/Mev; for photoproduction the corresponding number is ~1000 times smaller. A comparison is made with the work

of Cutkosky and Zachariasen and it is concluded that if there is no meson-meson interaction s-wave pair production may be neglected except possibly as the very threshold. (auth)

5077

CHEW-LOW FORMALISM FOR TWO INTERACTIONS. S. D. Drell (Stanford Univ., Calif.) and F. Zachariasen (Univ. of California, Berkeley). Phys. Rev. 105, 1407-9 (1957) Feb. 15.

An extension of the method of Chew and Low is developed for interacting bosom-fermion systems for which a portion (H_1) of the interaction can be treated exactly and is included in the zero-order problem. It is applied to the scalar pair term of meson theory. (auth)

5078

SATURATION OF NUCLEAR FORCES. C. DeDominics and P. C. Martin (Univ. of Birmingham, Eng. and Inst. for Theoretical Physics, Copenhagen). Phys. Rev. 105, 1419-20 (1957) Feb. 15.

A calculation was made of the energy of nuclear matter interacting by two-body forces. Saturation was predicted at a density and energy not very different from the ones determined empirically. The significance of the results is discussed. (B.J.H.)

URANIUM AND URANIUM COMPOUNDS

5079 AECD-3740

Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.

INTERACTION OF ENRICHED URANIUM ASSEMBLIES. H. F. Henry. Nov. 23, 1949. Decl. June 25, 1956. 12p. Contract [W-7405-eng-26]. (KS-89). $0.40(OTS).

The interaction effects of two or more sub-critical quantities of enriched U were considered for the purpose of evaluating the conditions for safe arrangement. A general interaction relation was successfully applied to available data from critical mass experiments and then used to indicate the degree of reactivity in arrays of U containers. (D.E.B.)

5080

TECHNOLOGY OF URANIUM DIOXIDE, A REACTOR MATERIAL. J. R. Johnson, S. D. Fulkerson, and A. J. Taylor (Oak Ridge National Lab., Tenn.). Am. Ceram. Soc. Bull. 36, 112-17(1957) March.

Uranium dioxide is useful as a reactor material for fuel elements both in bulk and granular forms. The physical properties of UO_2, its oxidation behavior, and reactions are discussed. Methods of preparation and fabrication are given followed by a brief survey of the potentialities of UO_2 as a reactor material. (auth)

5081

PARAMAGNETIC RESONANCE ABSORPTION IN URANIUM (III) CHLORIDE AND THE NUCLEAR SPIN, MAGNETIC DIPOLE MOMENT, AND ELECTRIC QUADRUPOLE MOMENT OF URANIUM-233. Paul B. Dorain, Clyde A. Hutchison, Jr., and Eugene Wong (Univ. of Chicago, Ill. and Clarendon Lab., Oxford, Eng.). Phys. Rev. 105, 1307-9(1957) Feb. 15.

Paramagnetic resonance absorption in single crystals of $U^{233}Cl_3$ diluted with $LaCl_3$ has been investigated. The values of the parameters in the appropriate Hamiltonian are given. The values of the nuclear spin, magnetic dipole moment, and electric quadrupole moment obtained from these studies are discussed. The ratios of the moments of U^{235} and U^{233}, which can be obtained with much higher accuracy than the individual moments, are given. (auth)

5082

FISSION CROSS SECTION OF U^{235} FOR FAST NEUTRONS. B. C. Diven (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 105, 1350-3(1957) Feb. 15.

An absolute measurement of the fission cross section of U^{235} for 1.27-Mev neutrons has been made. The neutron flux was measured with a recoil-proton proportional counter using a thin solid radiator of hydrogenous material. In addition, relative cross sections have been measured between 0.403 and 1.620 Mev. These relative measurements also utilized a recoil-proton flux monitor. The cross section has a constant value of 1.27 ± 0.044 barns in the neutron-energy interval between 1.0 and 1.5 Mev. (auth)

PATENTS

CHEMISTRY

5083

ELECTROLYTIC PROCESS OF SALVAGING URANIUM. Robert Q. Boyer and Scott B. Kilner (to U. S. Atomic Energy Commission). U. S. Patent 2,773,820. Dec. 11, 1956.

An electrolytic process is described for the scavenging of enriched U from oxalate solution in which it is accompanied by relatively greater amounts of ionized Ni, Fe, Cr, and Cu. The anode and cathode compartments of the cell used in this process are constructed with semipermeable dividers allowing ion transfer, but not intermixing of, the electrolyte solutions in the various chambers. The cathode is arranged so as to be in contact with a pool of Hg. When current is passed through the cell, the metallic ions migrate through the cell divider, and all, except the U, are reduced to the metallic state and as a result trapped in, or amalgamated by, the pool of Hg. The uranium oxalate solution is made the anode electrolyte, while the catholyte is 12 N HCl. A system of conduits keeps both electrolyte solutions and the Hg flowing to effect continuous operation. (auth)

5084

ELECTROLYTIC CELLS. Robert Q. Boyer and Scott B. Kilner (to U. S. Atomic Energy Commission). U. S. Patent 2,773,824. Dec. 11, 1956.

The cell consists of two superposed sections, the lower one containing a pool of Hg, and the upper one divided by porous partitions into a series of alternate anode and cathode chambers, the cathode chambers being open at the bottom to allow free communication with the Hg pool below. Each anode is a fixed plate but each cathode is a rotatable disc, part of which is immersed in the pool of Hg and part of which is exposed to the electrolyte in the cathode chamber proper. There are the necessary current terminals and a system of piping to provide for flow of the catholyte, anolyte and Hg to their respective chambers. (auth)

5085

ELECTROLYSIS APPARATUS. Frank A. Newcombe (to U. S. Atomic Energy Commission). U. S. Patent 2,773,825. Dec. 11, 1956.

A special crucible for the electrolysis of U halides in fused salt mixtures is described. Due to the high temperature employed, and to the corrosive nature of these fused salts and their vapors, electrolytic cells of ordinary construction are subject to rapid attack on all exposed parts. In the invention of this patent, a cylindrical graphite crucible, which forms one electrode of the cell is concentrically surrounded by a metal sleeve, a heating coil, and a mass of heat insulating material in that order. The entire assembly is enclosed by a base, sides, and a top of heat-resistant material. The top has a circular opening of the same size as the top of the crucible, the edges of which opening are sealed to the top edge of the crucible, thus excluding the corrosive vapors. (auth)

5086

ELECTROLYTIC APPARATUS FOR THE RECOVERY OF RARE REFRACTORY METALS. N. C. Beese and J. W. Marden (to U. S. Atomic Energy Commission). U. S. Patent 2,773,826. Dec. 11, 1956.

Apparatus which permits the deposition of substantially B-free U from the electrolysis of U halides in fused salt mixtures is described. The apparatus consists of a graphite barrier, which is connected to, and kept at the same potential as, the graphite crucible anode. The effect of this is to create between the crucible and the anode a region wherein the electric field is negligible. The U halide is introduced into this region of the cell, permitting it to reach the temperature of the fused electrolyte quickly and causing the vaporizable impurities, particularly B compounds, to be liberated before migration of the ions causes the impurities to reach the cathode and deposit along with the U. (auth)

5087

FILTERING APPARATUS. R. Cummings (to U. S. Atomic Energy Commission). U. S. Patent 2,774,479. Dec. 18, 1956.

A filtering apparatus for use in handling very valuable precipitates without loss is described. Three tanks are filled respectively with the slurry to be filtered, a wash solution, and a drying solution. The filter element is shaped like an inverted thimble, and attached to the lower end of an extendable hollow column. Through the column pass three suction tubes terminating at a valve which connects the tubes singly to the interior of the filter element. The column is suspended from an overhead carriage which permits its positioning over any one of the tanks and which also permits the column to be raised or lowered. In operation, the filter element is immersed in the slurry and the valve in the column connected to one of the suction tubes, drawing the filtrate through the tube and building up a filter cake on the outside surface of the filter. When the cake is sufficiently thick, the suction tube is disconnected and the filter element is withdrawn from the slurry tank and moved to the wash liquid tank. Here, a second suction tube is connected, drawing wash liquid through the filter cake and displacing any last traces of filtrate. The same process is repeated with respect to the drying liquid, only here the suction tube remains connected after the filter is taken from the tank, drawing a current of air through the filter cake and evaporating the drying liquid. The filter carrying the dry filter cake is then positioned over a set of scrapers, and the filtered material scraped off into a chute or hopper for collection. (auth)

5088

REMOTE-CONTROL MANIPULATOR. Raymond C. Goertz, Roland G. Schmitt, Jr., Robert A. Olsen, and Robert B. Wehrle (to U. S. Atomic Energy Commission). U. S. Patent 2,774,488. Dec. 18, 1956.

An improved arrangement for the slave arm of a remote-control manipulator is presented. A protective boot is attached to the end of the slave arm, to which the grasper is attached. A special arrangement of the boot, grasper and slave arm permits the slave arm, inside the boot, to manipulate the grasper outside of the boot. The slave arm is arranged so that no counterweight on the slave arm is arranged so that no counterweight on the slave arm is necessary therefore removal of the boot and movement or shifting of the manipulator is relatively easy. (auth)

5089

CONTINUOUS ELECTROLYTIC PROCESS FOR REDUCING URANIUM IN SOLUTION. R. Q. Boyer (to U. S. Atomic Energy Commission). U. S. Patent 2,775,552. Dec. 25, 1956.

An electrolytic process is described for the recovery of U from oxidized HCl solution in which it is accompanied by relatively greater amounts of ionized Ni, Fe, Cr and Cu. The anode and cathode compartments of the cell used for this process are constructed with semipermeable dividers between them, and the cathode is a rotating disc, part of which is immersed in a pool of Hg below the cathode chamber. The impure U bearing solution flows continuously through the cathode chamber, where all of its metallic constituents, except U, are reduced to the metallic state, and trapped in or amalgamated by the Hg. (auth)

5090

PROCESSES FOR RECOVERING AND PURIFYING URANIUM. M. D. Kamen (to U. S. Atomic Energy Commission) U. S. Patent 2,776,184. Jan. 1, 1957.

A process is described for the recovery of U values from deposits formed on the stainless steel parts of a calutron isotope separator. The deposits are dissolved by mineral acid and the solution oxidized to yield an oxidized acidic solution of U accompanied by Fe, Cr, Cu and Ni. This solution is then electrolyzed in a Cr cathode. When the current is passed through this cell, the Fe, Cr, Cu and Ni are all reduced to the metal and combine with the Hg cathode. The U, however, is not so reduced but remains in solution as the tetravalent ion, and is thus separated from the impurities arising from the stainless steel. The U is subsequently precipitated as the hydroxide by NH_4OH and may then be calcined to the oxide. (auth)

5091

METHOD OF CONCENTRATING FISSIONABLE MATERIAL. L. B. Werner, B. A. Fries and G. T. Seaborg (to U. S. Atomic Energy Commission). U. S. Patent 2,776,185. Jan. 1, 1957.

A process is described for concentrating dilute solutions of Pu. The process consists of alternately using La salt precipitate and Nb_2O_5 precipitates as carriers for the Pu, and of redissolving each precipitate in a substantially smaller volume of solvent than it was precipitated from. This cycle is repeated a sufficient number of times to obtain the desired degree of concentration. (auth)

5092

NITRIC ACID RECOVERY AND PURIFICATION. F. W. Winn (to U. S. Atomic Energy Commission). U. S. Patent 2,776,189. Jan. 1, 1957.

Nitric acid from ore digesting processes is recovered and reconcentrated by absorption of NO_2 vapors and/or by distillation of the diluted acid. Due to certain of its characteristics, any Cl^- present in the solution tends to accumulate and become very concentrated in the HNO_3 distillation and absorption towers, thus causing a very serious corrosion problem. The process of this invention overcomes this difficulty by withdrawing a portion of the HNO_3 undergoing concentration in the fractionating column, and treating the withdrawn acid with ozone to oxidize the Cl^- to Cl_2, which is removed, and then returning the chloride-free HNO_3 solution to the column. This continuous removal of HNO_3 effectively prevents the buildup of undesirable concentrations of Cl^-. (auth)

5093

PREPARATION OF URANIUM. Morris Kolodney (to U. S. Atomic Energy Commission). U. S. Patent 2,777,809. Jan. 15, 1957.

The process of obtaining pure U by electrolysis of a U halide in a fused salt bath was improved. The U metal is deposited upon the cathode in such an electrolytic process, and the inventor has found that if UCl_3 is utilized as the uranium halide, the bath can be operated at lower temperatures than previously, allowing the formation of crystalline U, rather than of U powder. (auth)

5094

PLUTONIUM ALLOY AND METHOD OF SEPARATING IT FROM URANIUM. Frank H. Spedding and Thomas A. Butler (to U. S. Atomic Energy Commission). U. S. Patent 2,778,730. Jan. 22, 1957.

A process is described for recovering and concentrating Pu contained in a large quantity of U. A relatively small quantity of Sn is melted with the U–Pu mixture, and upon solidification of the mass, two phases are formed, one consisting of U–Sn alloy carrying the bulk of the Pu, the other consisting essentially of metallic U. These two phases may be separated from one another by hydriding the mass with H_2 at low pressure and at approximately 250°C. Under these conditions the pure U phase is selectively hydrided, while the alloy phase remains unaffected and may then be separated from the uranium hydride powder by sieving, flotation, or the like. (auth)

5095

URANIUM CHELATES OF DI(SALICYLAL) ALKYLENEDIIMINE AND PROCESS FOR THEIR PREPARATION. H. D. Brown and Frederick J. Wolter (to U. S. Atomic Energy Commission). U. S. Patent 2,778,843. Jan. 22, 1957.

A group of new chelate compounds formed between U^{4+} and the members of a series of organic compounds designated as di (salicylal) alkylenediimines are described. Since the "disals" are soluble in water immiscible organic solvents of almost all types, and are not soluble in water, the U chelate compounds may be formed by contacting an aqueous solution of U^{4+} with a water immiscible organic solution of the disal alkylene diimine, and subsequently separating U chelate containing organic phase. A means is thus afforded, whereby U may be separated from aqueous solutions in which it is accompanied by trivalent rare earths, which are not chelated by the disal alkylene diimines. These U chelate compounds are destroyed by aqueous acidic solutions with a pH less than 2, thus affording a means of U recovery. (auth)

5096

RECOVERY OF URANIUM FROM WASH LIQUIDS. A. E. Ballard (to U. S. Atomic Energy Commission). U. S. Patent 2,779,657. Jan. 29, 1957.

A process is described for the recovery of U from wash solutions in which it is accompanied by greater or lesser amounts of Fe, Cr, Cu and Ni. The solution is first heated to 50°C and treated with an oxidizing agent, e.g., H_2O_2. Sulfuric acid is then added, the solution is cooled and small amount of NH_4OH added. This causes the formation of an easily filterable basic iron sulfate precipitate. After separation of this precipitate, more NH_4OH is added precipitating $(NH_4)_2U_2O_7$ away from the other impurities which remain soluble. The $(NH_4)_2U_2O_7$ is filtered out and may be redissolved in HNO_3 and the U values then precipitated from this solution as the peroxide. (auth)

5097

IMPROVEMENTS IN OR RELATING TO METHODS OF SEPARATING PLUTONIUM. To: The United Kingdom Atomic Energy Authority (Canada). British Patent 765,924. Jan. 16, 1957. Nuclear Power 2, 122(1957) March.

The dissolution of reactor fuel elements and the solvent extraction of Pu is described. (W.L.H.)

5098

IMPROVEMENTS IN OR RELATING TO PRODUCTION OF RADIOACTIVE PHOSPHORUS. To: The United Kingdom Atomic Energy Authority. British Patent 765,489. Jan. 9, 1957. Nuclear Power 2, 122(1957) March.

A method is presented for separating radioactive P from neutron-irradiated S by distillation in an inert atmosphere. (W.L.H.)

ENGINEERING

5099

MERCURY BELLOWS PUMP. E. S. Robinson, A. C. Briesmeister and B. B. McInteer (to U. S. Atomic Energy Commission). U. S. Patent 2,775,399. Dec. 25, 1956.

A liquid piston gas pump design that isolates and minimizes the gas contained in the pump, has a high pumping rate, and requires a minimum amount of power for operation is described. The pumping chamber, containing tappet-operated inlet and outlet valves is situated above a mechanically driven bellows. As the bellows is compressed Hg is forced into the pumping chamber compressing and expelling virtually all of the contained gas. Tappets attached to the bellows operate the valves in the proper sequence. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

5100

APPARATUS FOR SORTING RADIOACTIVE ORE. C. M. LaPointe (to U. S. Atomic Energy Commission). U. S. Patent 2,617,526. Nov. 11, 1952.

An apparatus for the sorting of particles of ore according to the degree of radioactivity of the particle is described. The apparatus consists of a feed mechanism for arranging sized particles singly and spaced apart on a conveyor. The conveyor leads the ore particles past a Geiger tube and when a particle has sufficient radioactivity, the tube energizes a sorter which removes the particle from the conveyor. (auth)

5101

CORROSION INHIBITORS FOR DEUTERIUM EXCHANGE PROCESS. C. F. Hiskey and D. T. Vier (to U. S. Atomic Energy Commission). U. S. Patent 2,776,263. Jan. 1, 1957.

Certain organic compounds are used as inhibitors of the corrosion of Fe apparatus caused by mixtures of H_2S and H_2O such as are encountered in the exchange process for the production of D_2O. These organic compounds are added to the system in minute quantities, and include quinoline, isoquinoline, phenylhydrazine, tannic acid and piperidine. (auth)

5102

IMPROVEMENTS IN OR RELATING TO THE PURIFICATION OF METALS. C. H. L. Goodman. To: The General Electric Co. Ltd. British Patent 763,350. Dec. 12, 1956. Nuclear Power 2, 121(1957) March.

Purification of metallic reactor fuels or coolants may be accomplished by fractionating fusion. (W.L.H.)

PHYSICS

5103

BEAM REGULATOR. Ernest O. Lawrence and Quentin A. Kerns (to U. S. Atomic Energy Commission). U. S. Patent 2,773,195. Dec. 4, 1956.

A circuit is described for automatically regulating the accelerating voltage of a calutron in order that the ion beam may maintain a stable path to the collector elements, thereby obtaining maximum separation of the isotopic mixture. This beam adjustment may be maintained independent of the spacing of the collector elements, thereby largely overcoming errors in spacing, and maintained independent of sparking or electrical discharge that would tend to reduce separation of the isotopes. (auth)

5104

LIQUID LEVEL INDICATOR. Earl O. Swickard (to U. S. Atomic Energy Commission). U. S. Patent 2,773,386. Dec. 11, 1956.

A liquid level indicator that will remotely, either manually or automatically, determine the level of a liquid regardless of the depth differential or the properties of the liquid is described. A vertical tube, sealed at the bottom, extends to the bottom of the container. A toroidal shaped float, containing a core of high-mu ferromagnetic material surrounds the tube and freely slides up and down the tube as level of the liquid, upon which it floats, changes. A suspended differential transformer counter-weighted and controlled by a selsyn system, is positioned in the tube at the level of the magnetic float. An unbalanced voltage will be produced when the differential transformer is asymmetric in relation to the float, such voltage causing the selsyn system to reposition the transformer, and thereby indicate the level of the liquid. (auth)

5105

SAFETY DEVICE FOR A NEUTRONIC REACTOR. John J. Goett (to U. S. Atomic Energy Commission). U. S. Patent 2,773,823. Dec. 11, 1956.

A device was designed to inject neutron absorbing balls of Cd or B into a reactor in the event the power level rises above a predetermined limit. This device comprises a passageway through the reactor, an exit for removing the balls after the emergency and a wheel adjacent thereto continuously revolving at high speed, with such balls contained on the periphery. When the power level of the reactor sufficiently increases, a sensing element opens a gate in the casing surrounding the wheel and the balls are propelled through the gate into the core passageway by centrifugal force, thus inhibiting the reactivity factor without permanently poisoning the reactor. (auth)

5106

NEUTRONIC REACTOR HAVING A FLATTENED ACTIVITY CURVE. Gale J. Young (to U. S. Atomic Energy Commission). U. S. Patent 2,774,730. Dec. 18, 1956.

A method of building a reactor that has a K factor substantially uniform across the core is given. In the past, the area having the highest K factor has been the center, with the result that the fuel in this area burns out the most rapidly as well as first reaches the maximum permissible temperature during operation, thus limiting the power level of the entire pile. This method places the more fissionable material on the periphery of the core, thus tending to equalize the K factor and neutron density over the core. This method results in a higher permissible operational power level and longer core life. (auth)

5107

METHOD OF MEASURING Q. Mitchell H. Dazey (to U. S. Atomic Energy Commission). U. S. Patent 2,774,937. Dec. 18, 1956.

An improved means of measuring the ratio of inductive reactance to effective resistance in a resonant cavity without requiring accurate adjustment of high frequencies is offered. The apparatus consists of a test cavity, a main oscillator, a variable frequency modulating oscillator, a reference oscillator, and a mixer circuit providing an output signal having a frequency proportional to the frequency difference of the reference and modulating oscillators. A frequency meter connected to the mixer circuit produces a signal proportional to the input signal frequency, and a chart recorder for the frequency meter showing a frequency difference as the band width of the cavity. (auth)

5108

MILLIVOLT GATING CIRCUIT. R. E. Thomas (to U. S. Atomic Energy Commission). U. S. Patent 2,775,696. Dec. 25, 1956.

A gating circuit is described which is capable of gating very low voltage pulses by eliminating the overshadowing cut-off pulse normally found in such a circuit. This is accomplished by a pair of gating tubes receiving coincident gating pulses of opposite polarity to prevent large output pulses at tube cutoff. This circuit permits the gating of millivolt pulses which heretofore has not been deemed possible. (auth)

5109

CRYSTAL DIODE COINCIDENCE CIRCUIT. Richard Madey (to U. S. Atomic Energy Commission). U. S. Patent 2,775,697. Dec. 25, 1956.

A coincidence circuit is described that will operate at very high frequencies as well as lower ones with improved discrimination. The circuit comprises a plurality of crystal diodes, the negative terminals of which are connected to input terminals and through resistors to ground. A load resistor, connected to a voltage source and to the positive terminals of the crystal diodes, is in parallel with a clamping circuit. A crystal diode acting as a discriminating element is connected through a coupling capacitor to the load resistor. The grid of a cathode follower output circuit is tied to the negative terminal of the discriminator element, and a constant current source is supplied to the positive terminal. This circuit provides good stability with relatively simple component parts. (auth)

5110

MULTICHANNEL PULSE ANALYZER. P. R. Bell, C. G. Gross and G. G. Kelley (to U. S. Atomic Energy Commission). U. S. Patent 2,775,698. Dec. 25, 1956.

A multichannel pulse analyzer for determining the pulse height distribution from sources of random height signals such as radiation counters is described. The apparatus comprises an A-1 amplifier which supplies two pulses to the analyzer. The desired portion of the signal is amplified in a window amplifier, the output of which is fed into a pulse lengthener circuit and then into discriminator channels. The pulse from the A-1 amplifier enters an inspection circuit which passes the pulse only if there is a sufficient interval between it and the succeeding pulse, and subsequently enters the discriminator channels. By insuring a sufficient time interval, distortion and interference of the pulses is eliminated. (auth)

5111

PHASE SHIFTING DEVICE. P. I. Corbell (to U. S. Atomic Energy Commission). U. S. Patent 2,775,741. Dec. 25, 1956.

A means for shifting phase at microwave frequencies in a transmission line, without causing reflections or continuity is offered. Instead of the usual method of placing shunt impedances in the line, a pair of dielectric rods or probes are inserted in the wave guide one quarter wave length apart so as to cancel reflections. Both probes, being of hollow glass are filled with a dielectric powder or fluid which may be compressed or displaced with a suitable fluid to vary the dielectric density of the probe. In order to vary or control the phase rotation, a means is provided to alter the distance that both probes extend inside the wave guide. (auth)

5112

COAXIAL TUBE COUPLING. V. L. Smith, D. R. Branum and H. M. Owren (to U. S. Atomic Energy Commission). U. S. Patent 2,776,368. Jan. 1, 1957.

A coaxial coupling chamber for a thyratron generator is described. A concentric housing encloses the tube and mounting means, a matching impedance is provided to engage the plate terminal of the thyratron and a coaxial coupling passing through the housing is connected to the grid of the thyratron. This device reduces reflections due to impedance mismatch and isolates the generated pulse, by

means of a filter circuit in the filament leads, from the coaxial output circuit. (auth)

5113

IN VIVO RADIATION SCANNER. H. O. Anger (to U. S. Atomic Energy Commission). U. S. Patent 2,776,377. Jan. 1, 1957.

An apparatus is described which is useful in clinical diagnosis for mapping the size and location of gamma-emitting tracers, and particularly for use in locating thyroid metastases. The apparatus consists of an array of scintillation counters in a lead shield with collimating holes therein. Glow lamps are arranged to flash when a count is detected by the scintillation counters, and a camera records the count while the area is scanned. This apparatus decreases the scanning time to about $^1/_{10}$ of that previously needed, as well as reduces the chance of error due to the variation in skill of the operator. (auth)

5114

LEAK DETECTION SYSTEM. Robert W. Powell and Paul H. Lee (to U. S. Atomic Energy Commission). U. S. Patent 2,777,812. Jan. 15, 1957.

A leak detection system designed to indicate leakage in the hermetically sealed cans of fissionable fuel material commonly used in a heterogeneous reactor is described. Helium gas is connected to each fuel slug through suitable manifolds, pressure gages and piping. Helium will not cause the fuel to oxidize, and being under pressure will flow out of any rupture, preventing air from entering and oxidizing the fuel. In case of leakage in a container, the pressure drop of the He will register on two gages and set off an alarm system permitting the defective container to be replaced before costly damage may occur. This system is doubly useful since it protects against container rupture, and indicates the defective container. (auth)

5115

CYCLOTRON SQUARE WAVE RF SYSTEM. G. B. Rossi (to U. S. Atomic Energy Commission). U. S. Patent 2,778,937. Jan. 22, 1957.

An improved radio frequency accelerating voltage system for a cyclotron is described. The normal sine wave type accelerating voltage has been replaced with an approximation to a square wave voltage, thereby permitting a peak accelerating voltage through substantially 180° of the voltage cycle. This results in increased beam intensity and improved stability. The square wave approximation is produced by mixing a fundamental sine wave with the third harmonic of the fundamental frequency, and is then fed into the high Q resonant circuits. (auth)

5116

ELECTROSTATIC PULSE ANALYZER SYSTEM. C. J. Borkowski and F. M. Porter (to U. S. Atomic Energy Commission). U. S. Patent 2,778,949. Jan. 22, 1957.

A pulse height analyzer for sorting and counting pulses received from radiation detection instruments with improved accuracy is described. The apparatus comprises a cathode ray tube, a conductive member having a plurality of aligned apertures, means for deflecting an electron beam across the apertures responsive to the magnitude of each pulse, resulting in a group of derived pulses for each input pulse, and means for counting the pulses in each group as well as the number of groups characterized by selected numbers of pulses. This results in an analyzer in which the variations of trigger sensitivity have a negligible effect. (auth)

5117

METHOD FOR UNLOADING REACTORS. L. Szilard (to U. S. Atomic Energy Commission). U. S. Patent 2,778,792. Jan. 22, 1957.

A method is described for unloading a neutronic reactor containing U metal as the fissionable material, by passing steam and H_2 in contact with the U metal to oxidize it to uranium oxide, then dissolving the oxide in place with HNO_3 and removing the solution from the reactor. This method dispenses with the necessity of complicated and expensive apparatus which has heretofore been used to remove the material from the reactor. (auth)

5118

CONTROL DEVICE FOR A NEUTRONIC REACTOR. W. H. Zinn and Thomas Brill (to U. S. Atomic Energy Commission). U. S. Patent 2,779,728. Jan. 29, 1957.

This automatic control system for a neutronic reactor, untilizes an ionization chamber, an optical galvanometer, and several photoelectric cells. The power level of the reactor is reflected in the neutron density. The ionization chamber measures this density and the output signal is fed to a galvanometer which registers the signal as angular displacement of an attached mirror. A light beam is reflected from this mirror to one of several photoelectric cells which activate the control rods in a manner appropriate to the operational level of the reactor, resulting in a simple accurate method of keeping the power level within preset limits. (auth)

5119

GALVANOMETER PULSE ANALYZER SYSTEM. C. J. Borkowski and F. M. Porter (to U. S. Atomic Energy Commission). U. S. Patent 2,779,875. Jan. 29, 1957.

A multichannel pulse analyzer which is designed to measure and sort a plurality of electrical signals with less circuitry than heretofore has been necessary, resulting in a smaller and less complicated piece of equipment is described. This is accomplished by measuring the magnitude of the pulses with a galvanometer which in turn is arranged to deflect a beam of light over a grid structure so that the area under the pulses is integrated and impulses may be generated on both the rise and fall of the pulse. Hence, for a given grid structure more channels are made available and increased range is attained in the analyzer. (auth)

5120

RADIOACTIVITY-DISTRIBUTION DETECTOR. C. A. Tobias and H. O. Anger (to U. S. Atomic Energy Commission). U. S. Patent 2,779,876. Jan. 29, 1957.

A radiation detector designed to give a visual image or indication that is a function of the incident radiation is described. This instrument would be particularly useful after a radiological event in enabling personnel to easily and quickly locate and avoid areas of intense radiation. The device comprises a case similar to a pinhole camera, the opposite wall of which contains a multitude of radiation detectors, each giving an electrical signal upon excitation, and behind that visible to the operators a corresponding light source for each detector so that a visual image of the radiation pattern is produced. (auth)

5121

IMPROVEMENTS IN THERMAL NUCLEAR REACTORS, IN PARTICULAR FOR AIRCRAFT PROPULSION. H. P. G. A. R. von Zborowski. British Patent 754,559. Aug. 8, 1956. Nuclear Power 2, 121-2(1957) March.

A thermal reactor is described which consists of a tube of fission material with a mass slightly over critical. The moderator is D_2O, H_2O, hydrocarbons, or a water-alcohol mixture. Control is achieved by regulating the massflow of the moderator. (W.L.H.)

5122

PROCESS OF NUCLEAR FISSION. To: Stichting voor Fundamenteel Onderzoek der Materie, Utrecht. British Patent

755,015. Sept. 12, 1956. Nuclear Power 2, 121(1957) March.

A reactor is described in which the fuel is a suspension of fissionable materials in a liquid, which may serve a moderator, coolant, or both. (W.L.H.)

5123

IMPROVEMENTS IN OR RELATING TO NUCLEAR POWER UNITS. S. G. Bauer and C. D. Boadle. To: United Kingdom Atomic Energy Authority. British Patent 763,231. Dec. 12, 1956. Nuclear Power 2, 121(1957) March.

An intermediate heat exchanger circuit for a liquid metal-fuelled reactor is introduced between the primary fluid and the working fluid. This provides a buffer against contamination in the event of a leak. Specifications are included. (W.L.H.)

5124

IMPROVEMENTS IN OR RELATING TO PRODUCTION OF RADIOACTIVE IODINE-131. C. C. Evans and J. Stevenson. To: The United Kingdom Atomic Energy Authority. British Patent 763,865. Dec. 19, 1956. Nuclear Power 2, 122(1957) March.

Iodine (I^{131}) is produced by the Te^{130} (n,β) I^{131} reaction, using thermal neutrons. The Te is heated above the boiling point in the irradiation, and I^{131} is distilled off and collected in aqueous caustic alkali. (W.L.H.)